Document Control No. 4400-59-AEVU

Revision 1

FIVE-YEAR REVIEW
FINAL REPORT

PERDIDO GROUNDWATER CONTAMINATION SITE
PERDIDO, BALDWIN COUNTY, ALABAMA

Work Assignment No. 59-4759

MAY 1995

Region IV

U.S. EPA CONTRACT NO. 68-W9-0057

Roy F. Weston, Inc.
1880-H Beaver Ridge Circle
Norcross, Georgia 30071

WESTON W.O. No. 04400-059-094-0005-00

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PROJECT ASSISTANCE

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U.S. EPA Contract No. 68-W9-0057
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MAY 1995

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SECTION 1

BACKGROUND

1.1 INTRODUCTION

The Perdido Groundwater Contamination (PGCS) Site was added to the National Priorities List (NPL) in September 1983 following a site investigation by the U.S. Environmental Protection Agency (EPA). The investigation revealed benzene contaminated groundwater remaining from a 1965 train derailment which prompted EPA to perform a Remedial Investigation/Feasibility Study (RI/FS). Following the RI/FS, a Record of Decision (ROD) was signed in September 1988. Construction of the remediation system commenced in May 1992 and concluded in November 1992. A description of the remedial action is presented in Section 1.4 of this report.

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), Section 121(c), and Section 300.430 (f)(4)(ii) of the National Oil and Hazardous Substances Contingency Plan (NCP), a statutory five-year review is required for remedial actions selected on or after October 17, 1986. The review must be completed within five years of the initiation of the remedial action, and every five years thereafter, for sites which will not allow for unlimited use and unrestricted exposure after attainment of the performance standards stated in the ROD.

EPA Region IV decided that a Level I Five-Year Review was required at the PGCS to confirm that the remedial action and associated performance standards as presented in the ROD of September 1988 adequately protect human health and the environment (i.e., the remedial action

is operating and functioning as designed and institutional controls are in place and are protective), and to evaluate whether original performance standards, such as cleanup levels, remain protective of human health and the environment. This report contains the information collected by Roy F. Weston, Inc. (WESTON®), on behalf of EPA Region IV, during the review and evaluation process.

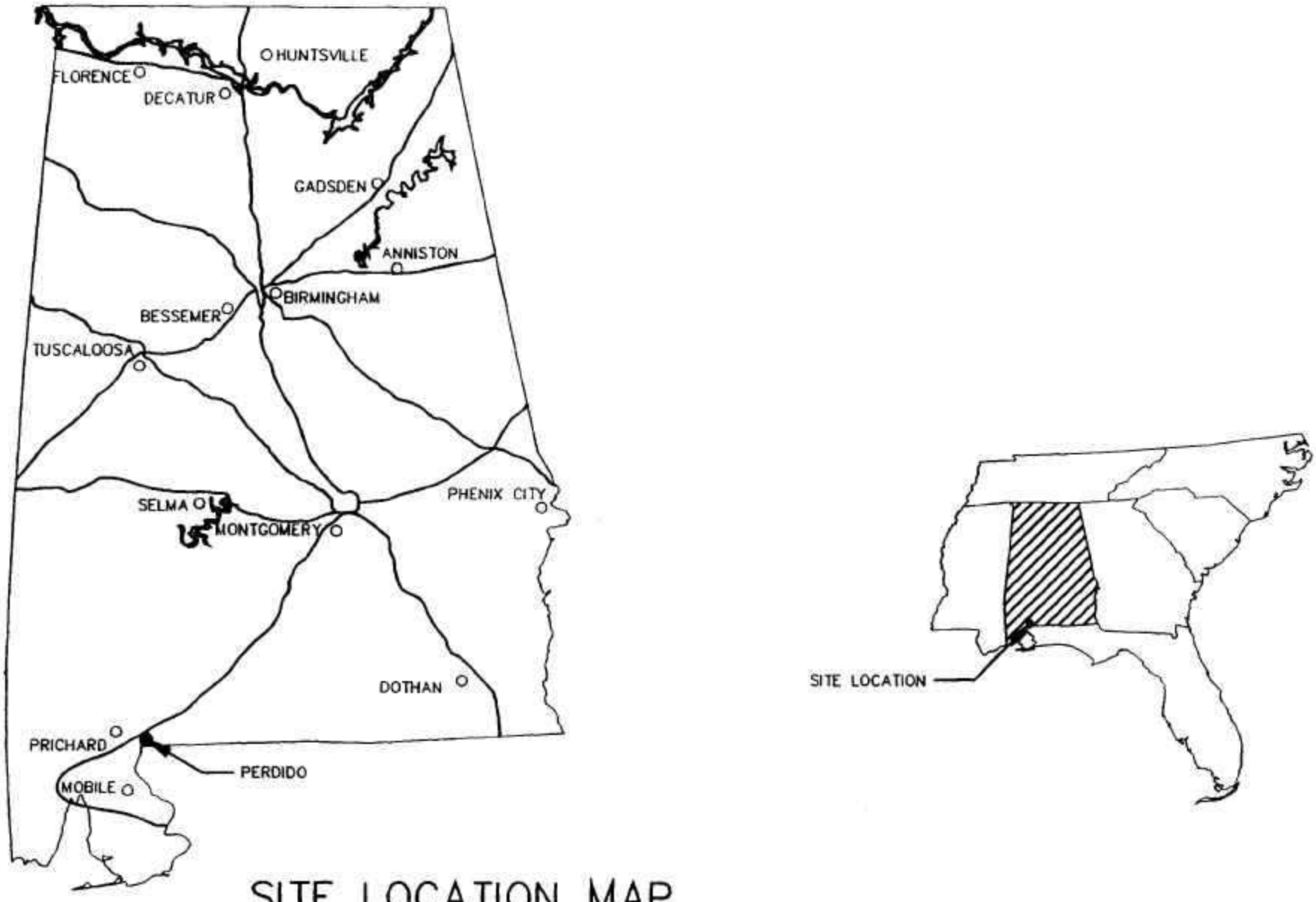
1.2 SITE LOCATION AND DESCRIPTION

The Perdido Groundwater Contamination Site is located in the town of Perdido, Baldwin County, Alabama near the intersection of State Roads 47 and 61 (See Figure 1-1). Groundwater contamination originated from a 1965 train derailment by the Louisville and Nashville Railroad (now CSX Transportation, Inc.) which occurred approximately 200 yards east of the intersection of State Roads 47 and 61. Chemicals from the derailed tanks were spilled into the drainage ditches along State Road 61. As a result of the spill, the chemical benzene penetrated through the soil and entered the groundwater aquifer used by area residents for their domestic well water.

The total area examined during the remedial investigation covers an area of approximately 125 acres. The area of groundwater contamination covers approximately 15 acres and is centered downgradient about 300 yards from the derailment site.

1.3 SITE HISTORY

A train accident occurred on May 17, 1965, in which 21 cars of the 122 cars in the train derailed. The rail cars left the track near the intersection of County Highway 61 and Railroad Street, along the eastern portion of a curve in the track. Approximately 75% of the benzene



SITE LOCATION MAP
PERDIDO GROUNDWATER CONTAMINATION SITE
PERDIDO, BALDWIN COUNTY, ALABAMA
FIGURE 1-1

04400001.DWG

contents of the ruptured car was spilled. On the morning of May 19, 1965, the derailed cars were accidentally ignited by a cutting torch and the fire consumed the remaining benzene.

In December 1981 the Alabama Department of Public Health (ADPH), Division of Public Water Supply (ADPWS) first documented reports of taste and odor problems in Perdido residents' domestic water supply wells. Two wells were sampled in February 1982 that showed benzene contamination. In August and September 1982, the Alabama Department of Solid and Hazardous Wastes (ADSHW) sampled 27 additional wells and found six of these contaminated with benzene. As a result of the benzene contamination, the Baldwin County Health Officer recommended that residents within a one-mile radius of the derailment stop using their well water for drinking or bathing. This affected approximately 250 residents in the area and over 300 students attending the junior high school. The National Guard provided two water tanks at the post office and the affected residents carted water home in plastic jugs.

In September 1982, the Centers for Disease Control (CDC) tested the urinary phenol levels of 30 residents whose wells were contaminated with benzene. Urinary phenol levels are used to detect recent exposure to benzene. None of the residents tested had elevated levels; however, the lack of urinary phenol was attributed to the fact that benzene is rapidly eliminated from the human body and Perdido residents had stopped drinking from their domestic wells before being tested.

The ADSHW then requested support from the EPA in determining the extent of groundwater contamination. During October 1982, ADSHW and EPA conducted groundwater sampling of 49 domestic water wells. The results of this investigation indicated a total of nine wells in the Miocene aquifer were contaminated. As a result, EPA proposed in December 1982 that the site

be placed on the National Priorities List (NPL) under CERCLA, otherwise known as Superfund. Placement of the Perdido site on the NPL became final on September 1, 1983.

In early 1983, state and county officials requested that EPA provide Perdido with funding assistance under Superfund so that an alternate supply of drinking water could be provided to the community. Immediate removal funding was provided by EPA in February 1983 to construct a water line that would extend six miles from the nearby town of Atmore, Alabama, and connect to the approximately 150 Perdido homes within a one-mile radius of the derailment site. At the suggestion of EPA Region IV, Seaboard System Railroad (now CSXT) voluntarily provided funds for and installed the Perdido water system. The water line and hookup were completed in July 1983.

In October 1985, CSXT entered into an Administrative Order of Consent (AOC) with EPA to conduct an RI/FS on the site. The RI was begun in 1986 and completed in November 1987. The FS was submitted to EPA in May 1988 and recommended groundwater extraction and treatment as the preferred remedial alternative for the site.

1.4 DESCRIPTION OF REMEDIAL ACTION

In September 1988, EPA selected groundwater extraction, on-site treatment, and reinjection as the remedial action for the site. The ROD was signed September 30, 1988. Target concentrations for the effluent groundwater were 0.005 parts per million (ppm) for benzene and 1.0 ppm for total suspended solids (TSS).

CSXT has undertaken implementation of Remedial Action for the groundwater withdrawal/ treatment at the Perdido Site as mandated by the Consent Decree signed between EPA and CSXT and dated July 17, 1990. The Remedial Design (RD) details the design of the remediation system.

In general, the remediation system is designed to:

- recover contaminated groundwater;
- treat contaminated groundwater with an air stripper to remove benzene (granulated activated carbon adsorption is used for removing benzene from the airstream); and
- upon meeting the cleanup objectives, return treated water back to the aquifer via reinjection, with overflow diverted to surface water discharge.

The remediation system consists of the following components:

- Groundwater Withdrawal System - 12 withdrawal wells were located within the benzene plume, parallel to the long axis of the plume. The withdrawal wells are located inside water-tight vaults and are connected to the treatment plant via double-contained, underground pipelines. Each well vault houses a pneumatic pump that delivers contaminated groundwater to the treatment plant.

- Groundwater Treatment System - Nine Maxi-Strippers™ (air strippers) transfer benzene from the contaminated water into the air stream, which in turn passes through the carbon adsorption unit prior to release to the atmosphere. The treated

water, once discharged from air strippers, passes through bag filters for removal of solids prior to reinjection back into the same aquifer.

- Treated Water Reinjection System - 10 reinjection wells were completed in the groundwater aquifer. These wells, which reinject treated water back into the aquifer, are located inside vaults and are equipped with controllers to regulate the flow of injection water into the aquifer. The wells are connected to the treatment plant by underground piping. Overflow from the reinjection system is diverted to the surface water discharge.

Construction of the remediation system began in May 1992. Installation and construction of the facility were completed in November 1992. The site layout including extraction, injection, and monitoring wells and the treatment facility is shown on Figure 1-2 (taken from the PRP contractor's Quarterly Monitoring Report).

During startup operations, the reinjection system was unable to accept the design flows. Based on a hydrogeological reevaluation, a surface water discharge to Perdido Creek was proposed to EPA. In June 1993, after public comment and EPA approval of an Explanation of Significant Differences (ESD), a surface water discharge pipeline was installed from the treatment facility to Perdido Creek. Treated water is diverted to the surface water discharge system only after the reinjection system reaches capacity.

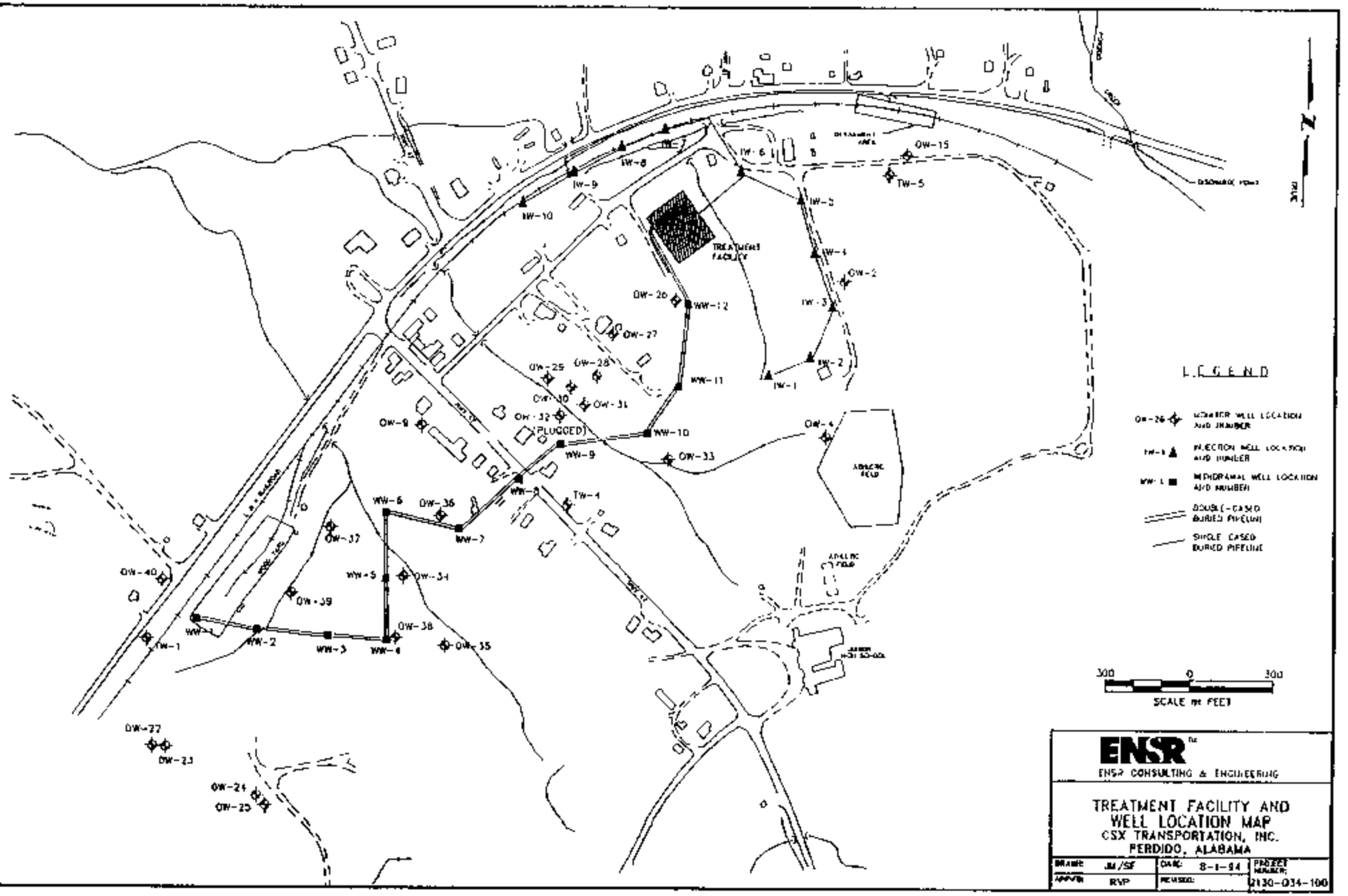

LEGEND
WATER WELL LOCATION AND NUMBER
INJECTION WELL LOCATION AND NUMBER
MONITORING WELL LOCATION AND NUMBER
DOUBLE-CASED BURIED PIPELINE
SINGLE CASED BURIED PIPELINE
TREATMENT FACILITY
ABANDONED FIELD
(PLUGGED)
300 0 300
SCALE IN FEET
ENSR CONSULTING & ENGINEERING
TREATMENT FACILITY AND WELL LOCATION MAP
CSX TRANSPORTATION, INC.
PERDIDO, ALABAMA
DRAWN: JM/SF
APPVD: RVP
DATE: 8-1-94
REVISED:
PROJECT NUMBER: 2130-034-100

FIGURE 1 - 2

1.5 ARARs REVIEW

Section 121 (d) (2) (A) of CERCLA incorporates into the law the CERCLA Compliance Policy, which specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Also included is the provision that State ARARs must be met if they are more stringent than Federal requirements.

The ARARs identified and considered in the ROD for the groundwater remediation included:

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- Resources Conservation and Recovery Act (RCRA)
- Occupational Safety and Health Act (OSHA)
- Safe Drinking Water Act
- National Pollutant Discharge Elimination System (NPDES)

WESTON reviewed these ARARs with respect to change in the standards as well as any new standards promulgated since the remedial action.

The Alabama Department of Environmental Management (ADEM) was contacted to identify any state ARARs promulgated or modified since the ROD signature. The Federal Maximum Contaminant Level (MCL) for benzene of 5 parts per billion (ppb) remains valid since the state

has no specific standard. The Underground Injection Program of the State Groundwater Section is to review standards for the injection wells under Chapter 335-6-8.

The addition of the overflow discharge to Perdido Creek as presented in the ESD must comply with surface water discharge requirements under the National Pollutant Discharge Elimination System (NPDES). The State of Alabama regulates this program and did not require a permit be obtained. The only requirement is that the discharge rate be limited to 100 gallons per minute (GPM).

SECTION 2
SITE CONDITIONS

2.1 SUMMARY OF SITE INSPECTION

WESTON representative Ralph P. McKeen performed a site inspection on March 6 & 7, 1995, during one of the PRP's quarterly monitoring sampling events. The inspection consisted of a walk-through of the treatment facility and the withdrawal and reinjection well system. The PRP's contractor representative, Clyde Hopkins (Reidel-Peterson Environmental Services), provided access and acted as the guide throughout the site inspection. Mr. Hopkins has been the Project Manager at the site since construction and setup of the entire pump and treat system. The purpose of this walk-through was to evaluate components of the remediation with respect to requirements in the ROD. WESTON utilized the *Prefinal/Final Remedial Action Inspection Report* as a tool for documenting the field inspection. A completed copy of this report is included as Appendix A.

The following is a summary of WESTON's observations made during the site inspection visit with references to photographs which are included as Appendix B of this report. Photograph No. 1 shows the groundwater treatment facility consisting of the air stripping units, pumps, air compressor and controls. The facility is very well maintained and is secured with a perimeter fence to prevent unauthorized access. Mr. Hopkins pointed out all the features of the treatment system from the incoming flow to the treated effluent discharge. (See Photograph No. 4 showing the entire treatment system). Currently, the treatment system is processing approximately 180 GPM of contaminated groundwater from the 12 withdrawal wells, which is less than the 250 GPM capacity of the treatment system.

The air stream from the air stripping units exit the building and are treated via a carbon adsorption unit that contains 12,000 pounds of activated carbon (Photograph No. 3). The carbon unit has three sampling ports to check carbon usage breakthrough. The three sampling ports are used to test for total volatile organic compounds by pulling a sample through a colorimetric tube indicator via a vacuum pump. The three ports represent the percentage (77, 83, and 94) of carbon spent based on breakthrough. This provides the operator lead time for making arrangements to change out spent carbon. Spent carbon is transported off site as a solid hazardous waste for regeneration. See Appendix C - Site Documentation for copy of the manifest record. An air sample is collected from the carbon unit quarterly with a vacuum canister and sent to Analytical Technologies, Inc. (ATI), in Pensacola, Florida for BTEX analysis. The most recent analytical data show that the effluent air being discharged to the atmosphere is below the method detection limits for BTEX compounds.

Treated effluent water from the facility is reinjected into 10 injection wells with overflow discharge to Perdido Creek. The injection wells cannot accommodate the incoming flow from the withdrawal wells so through an ESD, the EPA and ADEM approved the discharge of overflow to Perdido Creek with a 100 GPM discharge limit. Based on the current operations, the discharge to Perdido Creek averages approximately 30 GPM. An effluent sample is collected quarterly by ATI for BTEX analysis with the most recent data showing BTEX compounds, particularly benzene, below the method detection limits (1 ppb), which is below the discharge criteria for benzene of 5 ppb as stated in the ROD. The discharge to Perdido Creek is piped and discharged below the water surface. WESTON observed the discharge, which is only visible as a swirling action near the water surface (Photograph No. 9).

We then proceeded to the southwest portion of the site to observe the observation well sampling being prepared by technicians from ATI of Pensacola, Florida. To document the sampling procedures, WESTON completed the EPA-ESD Region IV Field Overview Checklist as presented in the Region IV SOP Manual (Attachment D). WESTON observed ATI during purging and sampling of OW-37, OW-39, and OW-40 (Photograph No. 10). These wells were all sampled in accordance with the EPA approved sampling plan and Region IV standard operating procedures. While the wells were being purged, the Reidel-Peterson system operator, Mr. D.C. Harville, opened a withdrawal well vault for inspection (Photograph Nos. 6 & 7). The vaults are below ground surface, covered, and locked with a steel manhole cover. According to Mr. Harville, the only maintenance required on the extraction wells is involved with the controller which sends the pulsed air supply to the pneumatic downhole pumps.

WESTON's Ralph McKeen departed the site and drove to the Bay Minette Public Library to examine the Information Repository and the Administrative Record for the site. The file was readily available for review and contained many of the documents relating to the decision process for the selected remedy. Copies of the cover and index were made and are included in Appendix C (Site Documentation). The Information Repository did not have any recent monitoring data from the quarterly sampling events. The most recent analytical data was February 26, 1993.

On March 7, 1995, WESTON's Ralph McKeen returned to the site for completion of the site inspection visit. Much of this day was spent visiting with local individuals for input and reactions to the remedial action taking place in their neighborhood. Comments from these interviews are presented in Section 2.3 of this report.

Additional time was spent with the on-site operator, Mr. D.C. Harville, to get a feel for how well the system is running and documentation procedures being implemented. Mr. Harville lives locally and makes inspection visits 7 days per week and is available for troubleshooting when notified by the remote monitoring system called a Chatterbox (Photograph No. 5). The system is a voice synthesis remote monitor that will detect an upset condition and call the home and mobile phone numbers of Mr. Harville. The monitor will leave a message relating the particular component of the treatment system which is experiencing difficulties. Mr. Harville completes weekly and monthly logs of operations (See Appendix C - Site Documentation) which are faxed to the PRP's coordinator, Mr. Ken Richardson, and the Design Engineer, Mr. Raaj Patel. These reports are also included in the quarterly sampling reports prepared by ENSR.

Mr. Harville is very knowledgeable about the treatment system and has received training from the equipment vendors for the individual components of the treatment system.

2.2 SUMMARY OF INTERVIEWS

The Five-Year Review process requires that key individuals involved with the site be contacted for interviews. The interview process in intended to ascertain any new applicable information regarding the selected remedy, site history, and other site-specific issues.

Mr. Kenneth W. Richardson, Jr., P.E., CSX Transportation representative, was contacted for input regarding the site. Mr. Richardson is an engineer for environmental affairs with CSXT and has been involved with the site since 1986 during the remedial investigation stage of the project.

Mr. Richardson stated that "there has been substantial turnover of personnel with the State and EPA for this site and that due to the turnover, CSXT is very sensitive to requests that differ from original agreements." Mr. Richardson welcomes suggestions that would enhance the cleanup and remediation efforts at the site; however, CSXT is sensitive to repeat requests that have been previously discussed and resolved early in the project.

Mr. Richardson commented on the lease agreements with the landowners in Perdido that allow CSXT to operate extraction and monitoring wells on their property. The lease agreements are five-year contracts and are close to expiring. While he does not anticipate a problem with renewal of these agreements, CSXT cannot guarantee that access through these lease agreements can always be obtained. Therefore, it may become necessary in the future for EPA involvement on this issue.

Overall, Mr. Richardson is very happy with the system and feels that it is working well. He said that the system treats close to one million gallons of water and that O&M costs are between $20,000 - $25,000 per month.

WESTON contacted the ADPH in Montgomery, Alabama to discuss the project. ADPH has been involved with the site since 1981 when reports of taste and odor problems in domestic water well first surfaced. Mr. J. Neil Daniell, ADPH Geologist, is currently involved with the site from a public health perspective. Based on public health concerns, ADPH has worked closely with the Agency for Toxic Substances and Disease Registry (ATSDR) in performing health assessments. The most recent assessment occurred on September 30, 1994, which is documented in a Site Review and Update (Appendix E). Based on recommendations from this review a well survey was conducted to determine the number of private wells and their use in

the area. The survey was completed in November 1994 which revealed that no residents are using private wells within the plume or near its boundaries since all are connected to public water supply. (See Appendix E). Mr. Daniel believed some issues and items were overlooked in the past such as improper identification of wells and complete characterization to identify the extent of the plume. Currently, though, he felt that the PRP's are adequately responding to questions and concerns raised by the State. When asked about overall public health threats, Mr. Daniel replied that the potential for new drinking wells being drilled within the plume are minimal. There are no formal restrictions in place to prevent a well from being drilled since Perdido is unincorporated but all the local well drillers are aware of the site and understand the situation. Further, the ADPH is required to review data on newly drilled wells so they would be aware of any potential new wells within the plume area.

Also contacted for issues from ADEM's perspective was Mr. David Thompson, Environmental Engineer of the Special Projects Department. Mr. Thompson stated that ADEM receives the quarterly monitoring reports and typically will have a hydrogeologist from their Groundwater Branch review the data. He stated that "the PRP's have been very responsive to ADEM's requests and concerns." In a letter dated December 7, 1994, ADEM requested additional data (See letter in Appendix E) and the PRP followed up with responses immediately. Based on a quick review of the Quarterly Monitoring Report for the 4th quarter 1994, Mr. Thompson felt that all requested data had been incorporated. Overall, he stated that "CSXT is doing what they are supposed to be doing in that they are recovering benzene."

Raaj Patel, Project Manager with ENSR, was contacted to provide information and comments regarding the technical aspects of the project. Mr. Patel has been involved with the project since the remedial investigation and remains as the current Project Manager for O&M activities.

Mr. Patel stated that during the first few months of operation that some initial debugging was necessary, including some adjustments necessary to properly size the air stripping units. Since then, he said that the system is operating well.

Currently, they are focusing on establishing real time pumping rates from the extraction wells. He feels this is necessary since it is the extraction wells that capture the plume, and current pumping rates are needed to verify that the entire plume is being captured. This is especially critical in the downgradient line of extraction wells which must be maximized so that the plume does not migrate further downgradient.

Overall, he is pleased with the system and can utilize the Chatterbox remote monitoring system to check the status of any component via telephone.

In addition, he said that ENSR will continue to evaluate the groundwater extraction system by remodeling, using the most current pumping and reinjection rate, to ensure that the plume is contained and capture zones maximized.

During the site reconnaissance visit, WESTON contacted local individuals to obtain their impression of the remedy and operations currently ongoing. Mr. Leo Odom who operates Odom's Service Center located on Highway 47 in Perdido believes that the remedy is being implemented properly and that CSXT and its' contractors are doing a fine job. His concerns were more related to two abandoned underground storage tanks located on his property. The tanks are empty and will require an environmental assessment according to ADEM's underground storage tank (UST) program followed by closure.

WESTON then interviewed Ms. Bertha T. Emmons, an employee at the Post Office. Ms. Emmons has been involved with the site since 1981 and was one of the first individuals to notice the bad odor and taste in the Post Office drinking water well. She recalls the quick response made to provide bottled drinking water to the community followed by hookup to the public water supply. Ms. Emmons believes that CSXT has done everything possible to help the local community since the discovery of groundwater contamination. As for the current operations, Ms. Emmons feels very comfortable with the operator, Mr. D.C. Harville, and feels safe as long as she sees trucks and personnel moving around the site.

WESTON contacted the Perdido Water Board office and spoke to the Clerk, Ms. Glennes Hadley. Ms. Hadley stated that she continues to receive documentation for the Information Repository and it is placed in a box for the public to view. However, the office is open only a few hours daily and the records are seldom looked at by the public. Ms. Janita Edmondson, a Perdido Water Authority Board Member, provided input about the current operations. Ms. Edmondson has no concerns about the operations and the remedial action but feels that the PRP and the contractors keep to themselves too much. She would like to be more informed about the current status and suggested that the PRPs or contractors provide regular briefings to the Water Board that could be presented to interested parties at the Board's monthly meetings.

2.3 AREAS OF NON-COMPLIANCE

WESTON did not observe any areas of non-compliance during the site visit. The PRP and their contractor are taking every measure possible to maintain the treatment facility and the wells. In addition, the system is treating contaminated water to below the cleanup levels prescribed in

the ROD, based on a review of the effluent data from the carbon units and the air stripping units.

SECTION 3
RECOMMENDATIONS

3.1 TECHNOLOGY RECOMMENDATIONS

WESTON has reviewed the quarterly groundwater sampling results and found that the treatment system remains effective in removing contaminants to levels below the specified action levels. O&M activities are in place and are being implemented by knowledgeable individuals. Effluent water and air being discharged from the system is effectively monitored and sampled.

As a review of the extraction system, WESTON reviewed the "Submittal of Remodeling Results for the Perdido Groundwater Remediation Site in Perdido, Alabama," dated September 12, 1994, (Appendix F). This report was prepared by ENSR Consulting and Engineering to evaluate the effectiveness of the extraction well system. The Groundwater Flow Model, Flowpath®, was used during the evaluation. The following comments and recommendations are based on a review of the remodeling:

- Page 2 - Recharge Rates

  This paragraph states that "in order to calibrate the model, the infiltration/recharge rates were changed from the previous model." Rather than changing the infiltration/recharge rates, the model should have been run with the modified boundary conditions using the previous infiltration/ recharge rates. Also, using an infiltration/recharge rate of zero to calibrate the model is not representative of actual field conditions. The justification for use of the January 1983

potentiometric map also needs to be explained in greater detail, and a figure showing this surface should be provided.

- Page 4 - Calibration of the Model

  The water balance error may be due to the model boundary conditions. The boundary conditions should be re-evaluated to determine if the water balance error may be eliminated.

- Page 4 - Calibration of the Model

  A sensitivity analysis should be performed to determine the effects of changes to various input parameters. The results of this analysis should be provided to EPA.

- Figures

  The attached figures do not provide the reader with enough detail to evaluate the head distributions and capture zones. Revised figures should be prepared, showing groundwater (particle) flow paths, labeled withdrawal and reinjection wells, and labeled contours, and the clear depictions of the capture zones.

  In Figure 4, it appears the wells located north of the benzene plume were not operating during the 10-year simulation. Please explain this apparent discrepancy.

3.2 ADMINISTRATIVE RECOMMENDATIONS

The Information Repository should be updated to include recent monitoring data. Also, the PRP's should provide an update of activities to the local Perdido Water Board so that local interested parties could be informed of the project status. As described in the interview process, the local residents feel comfortable with the remedial action but would prefer to know more about the current status of the site through a briefing.

3.3 REQUIREMENTS FOR RECOMMENDATION IMPLEMENTATION

Technically, the remedial action implementation should resume as there appears to be no deficiencies in the operation of the system.

Based on input from the community, it would be beneficial for a CSXT representative or one of their contractor's to periodically (quarterly) attend the Water Board meetings and provide an update on the current status of the project. The update should incorporate the most recent quarterly sampling results presented in general terms.

3.4 STATEMENT ON PROTECTIVENESS

Based upon the groundwater monitoring results, the remedial action appears to be performing as intended. Benzene concentrations have declined from high values of 28.5 ppm in 1986 to 9.3 ppm in the most recent quarterly sampling data. Since there are no domestic water wells currently in use within a one-mile radius, there is no threat to public health (this has been confirmed by the ADPH). Review of the effluent data indicate that vapor discharge to the

atmosphere as well as injected water and surface discharge water is clean. So as long as the system is maintained, the treatment system will function to reduce levels of contaminants below cleanup standards. Handling and manifesting of contaminated media is being properly shipped off-site reducing any potential exposure to the local community.

3.5 NEXT REVIEW

During the next review, WESTON suggests a similar format and level of effort. Additional time should be spent on evaluating the vulnerability of the remedy to stress, wear, and to any physical deterioration. Since the system has only been in operation since May 1992, the equipment was still relatively new during this review. Sampling of wells outside the inferred plume area may be required to confirm the extent of the plume if the PRP is not already performing this as part of the observation testing.

APPENDIX A

PREFINAL/FINAL REMEDIAL ACTION INSPECTION REPORT

PREFINAL/FINAL REMEDIAL ACTION INSPECTION

Site Name: Perdido Groundwater Contamination Site	**Date of Inspection:** March 6-7, 1995
Site Location: Perdido, Baldwin County, Alabama	**Inspection #:** 1st 5-Year Review
Operable Unit: N/A	**Time of Arrival:** 0800 Hours
Inspector's Name & Affiliation: Ralph P. McKeen (Roy F. Weston, Inc.)	**Time of Departure:** 1400 Hours

Parties Present:
Clyde Hopkins - (PRP Contractor) Riedel-Peterson (Project Manager)
D.C. Harville - (PRP Contractor) Riedel-Peterson (Treatment System Operator)

Ricky Hagendorfer - Field Sampling Technician (Analytical Technologies, Inc.)
Roger Yawn - Field Sampling Technician (Analytical Technologies, Inc.)

Temperature:	**Wind Direction:**	**Wind Speed:**
75°F Mostly sunny	N/A	Calm

Weather Narrative:
Mild temperatures and mostly sunny skies both days. Increasing clouds on March 7, 1995 with impending rain showers likely.

Description of Remedy:

Remedial actions currently ongoing consisting of groundwater extraction and treatment which was completed in November 1992. Benzene contaminated groundwater is extracted via 12 withdrawal wells located inside water-tight vaults and connected to the treatment plant. Treatment consists of air stripping with vapor phase carbon units. The effluent is reinjected to the aquifer system via 9 injection wells and surface discharge to Perdido Creek. Target effluent concentrations are 0.005 ppm benzene and 1.0 ppm TSS.

General Post-Construction Site Conditions:	**Yes**	**No**	**NA**	**Comment #**
1. Are fences and gates intact?	X	☐	☐	
a) Are they locked?	X	☐	☐	
b) Name, address & phone # of person(s) who has keys: D.C. Harville & Clyde Hopkins (Riedel-Peterson) 3536 Desirrah Drive Mobile, Alabama 36618				
2. Are warning signs clear & easily seen?	X	☐	☐	At both the treatment facility and along buried lines

PREFINAL/FINAL REMEDIAL ACTION INSPECTION

Site Name: Perdido Groundwater Contamination Site		Date of Inspection: Marche 6-7, 1995		
General Post-Construction Site Conditions:	**Yes**	**No**	**NA**	**Comment #**
4. Are access roads in good conditions?	X	☐	☐	
5. Is grass cover adequate?	☐	☐	X	
a) Is grass cover higher than 4 inches?	☐	☐	☐	
6. Is there any noticeable erosion?	☐	X	☐	
7. Has construction equipment, waste & debris been removed?	X	☐	☐	
8. Are site buildings complete and in good condition?	X	☐	☐	Treatment plant very clean

3. Are monitoring wells in good condition?	X	☐	☐	
a) Are they easily identifiable?	X	☐	☐	
b) Are they locked?	X	☐	☐	

c) Name and address & phone # of person(s) who has keys:
D.C. Harville & Clyde Hopkins (Riedel-Peterson) (205) 479-6500

PREFINAL/FINAL REMEDIAL ACTION INSPECTION

Site Name Perdido_GW Contamination Site **Date of Inspection** 03 / 06 / 95

INSTRUCTIONS: Provide details of the problem and recommended corrective actions below. (Additionally, if possible, indicate the location of each problem on an attached map.)

COMMENT NUMBER	COMMENT

COMMENT NUMBER	CORRECTIVE ACTION RECOMMENDATION

SIGNATURE OF OBSERVER: _____

DATE: 3 / 7 / 95

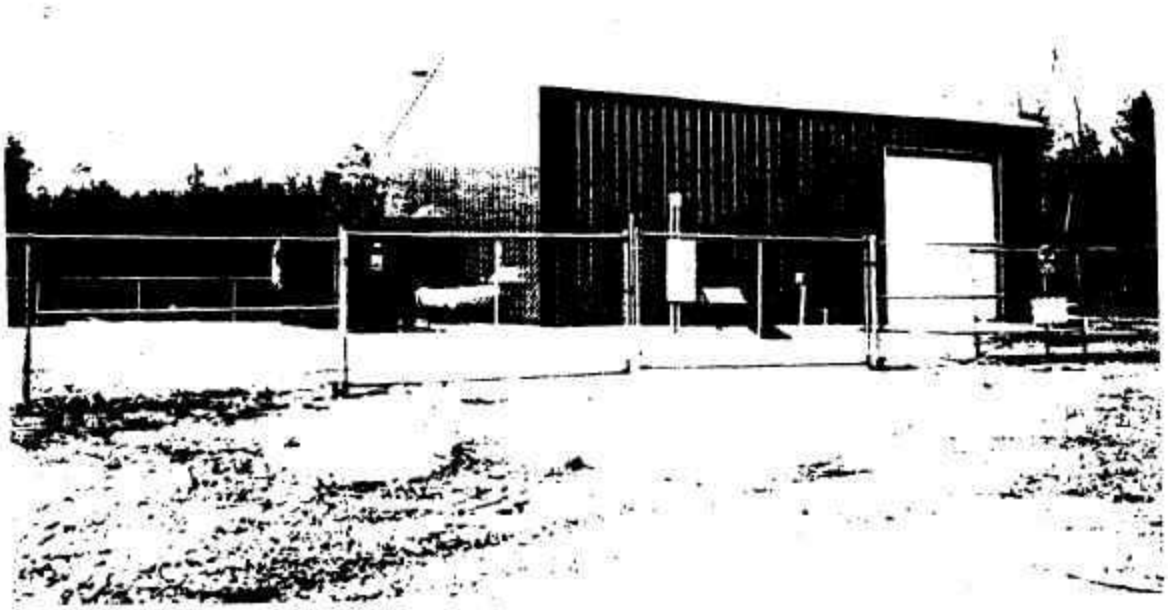
Site-Specific Post-Construction Conditions:	Yes	No	NA	Comment #
Note: This section should be filled in prior to 1st inspection with questions about the site remediation that can be visually checked; for example; for a groundwater treatment system -- is the system operational, no leaks, monitoring stations in place, etc. A site map may be useful for indicating site problems needing correction.				
1. Withdrawal/Injection Wells	X	☐	☐	Very well maintained
2. Treatment Plant	X	☐	☐	Very well maintained
3.	☐	☐	☐	
4.	☐	☐	☐	
5.	☐	☐	☐	
6.	☐	☐	☐	
7.	☐	☐	☐	
8.	☐	☐	☐	
9.	☐	☐	☐	
10.	☐	☐	☐	
11.	☐	☐	☐	
12.	☐	☐	☐	
13.	☐	☐	☐	
14.	☐	☐	☐	

Additional conditions observed:

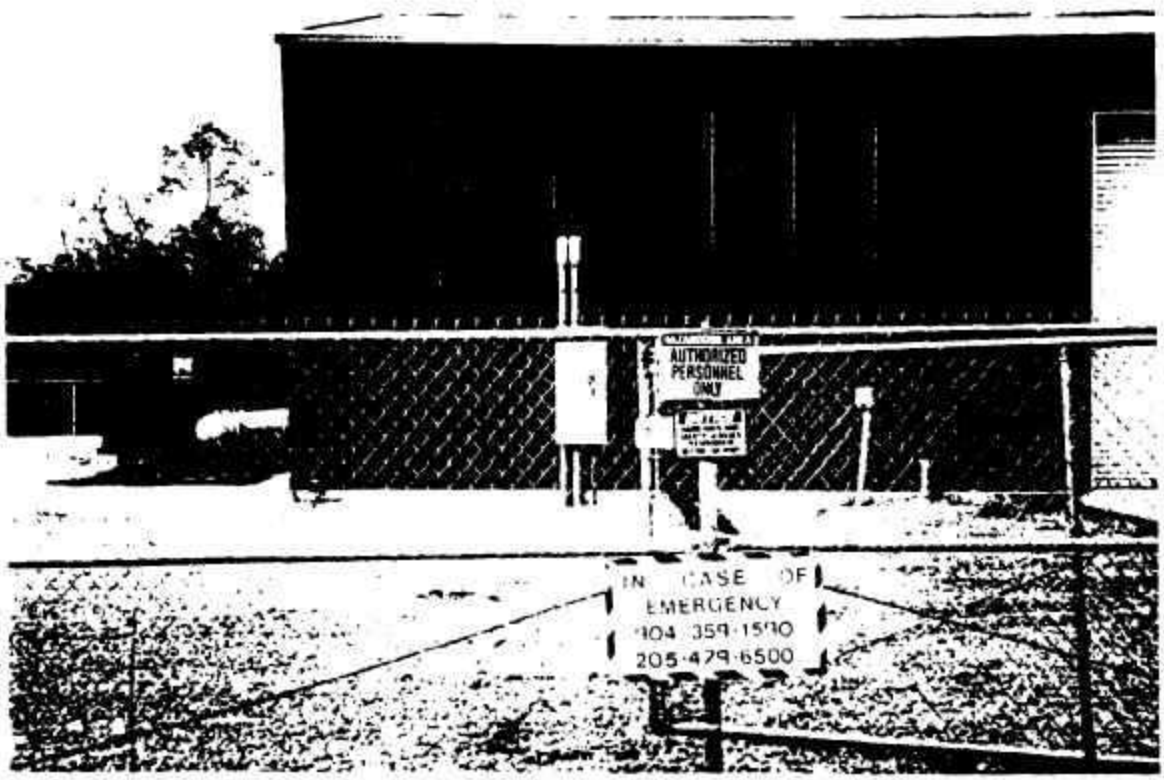
The treatment system is fully automated. The operator, Mr. D.C. Harville, monitors the system daily but does not have to adjust the flowrates. He is very knowledgeable about the system. Power outages appear to be the only operational problem. During thunderstorms, the power supply from Alabama Power Company is frequently disrupted. The downtime is minimized by the use of a voice sythesis remote montitor located in the treatment building which will call the operator with a message relating the system which is experiencing difficulty.

APPENDIX B

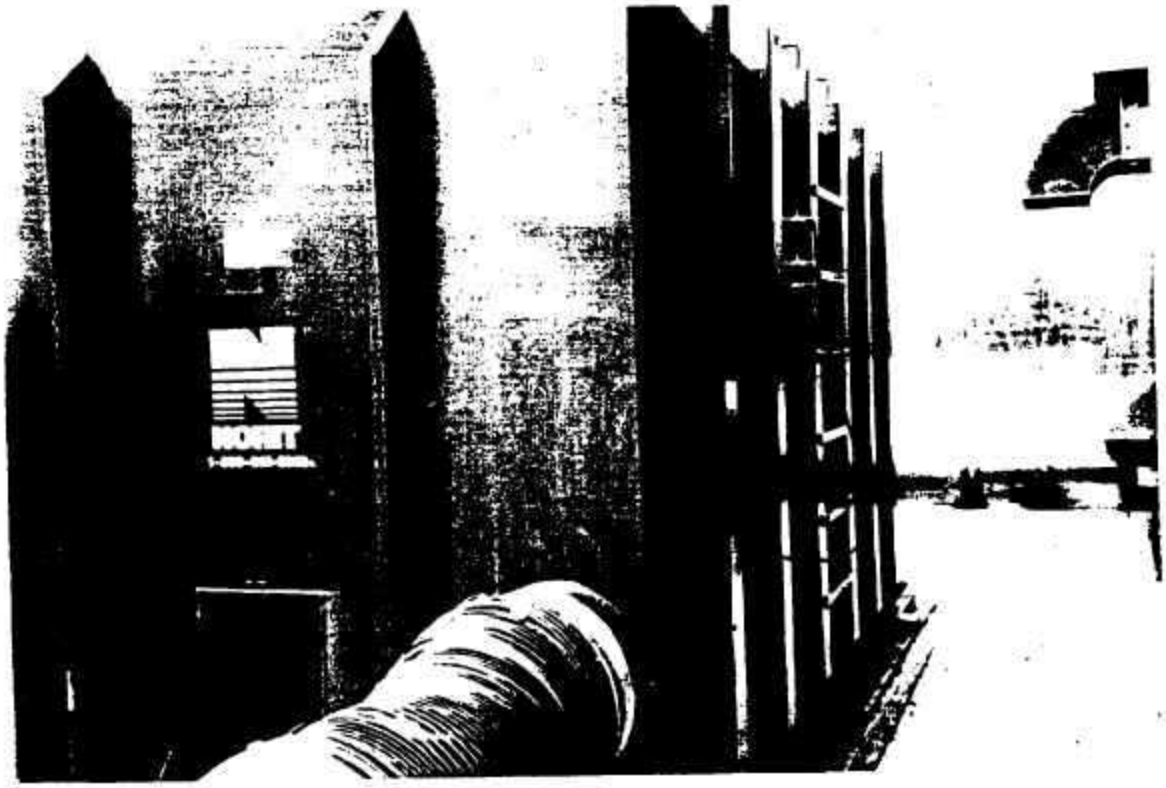
PHOTOGRAPHS



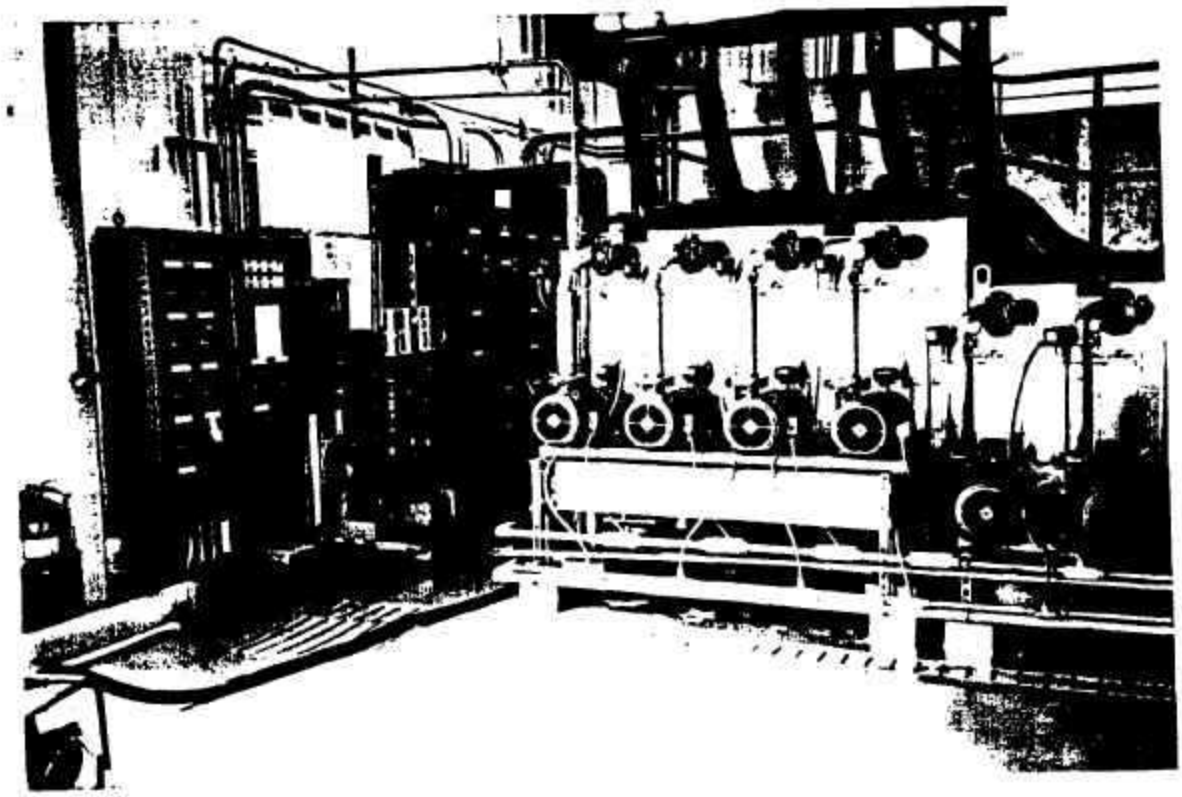
Photograph No. 1 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Outside view of building which houses majority of the water treatment system.



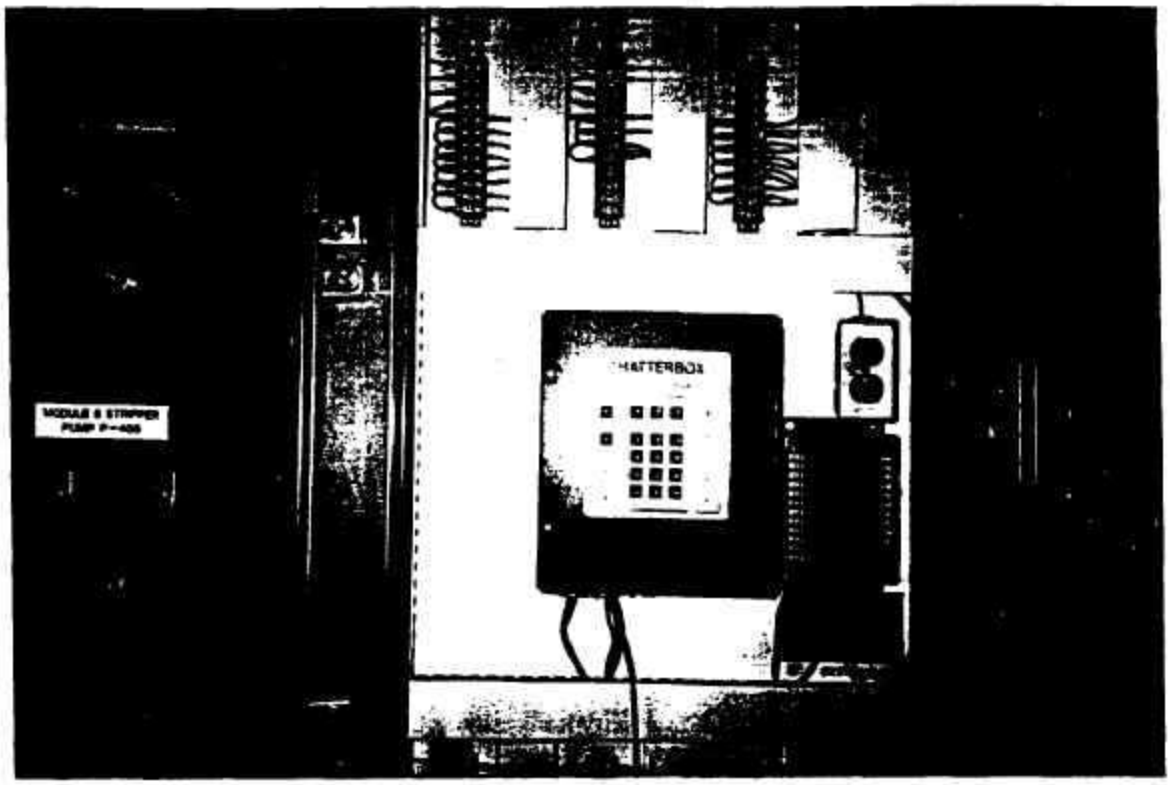
Photograph No. 2 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Treatment facility secured and posted with emergency telephone numbers and warning signs.



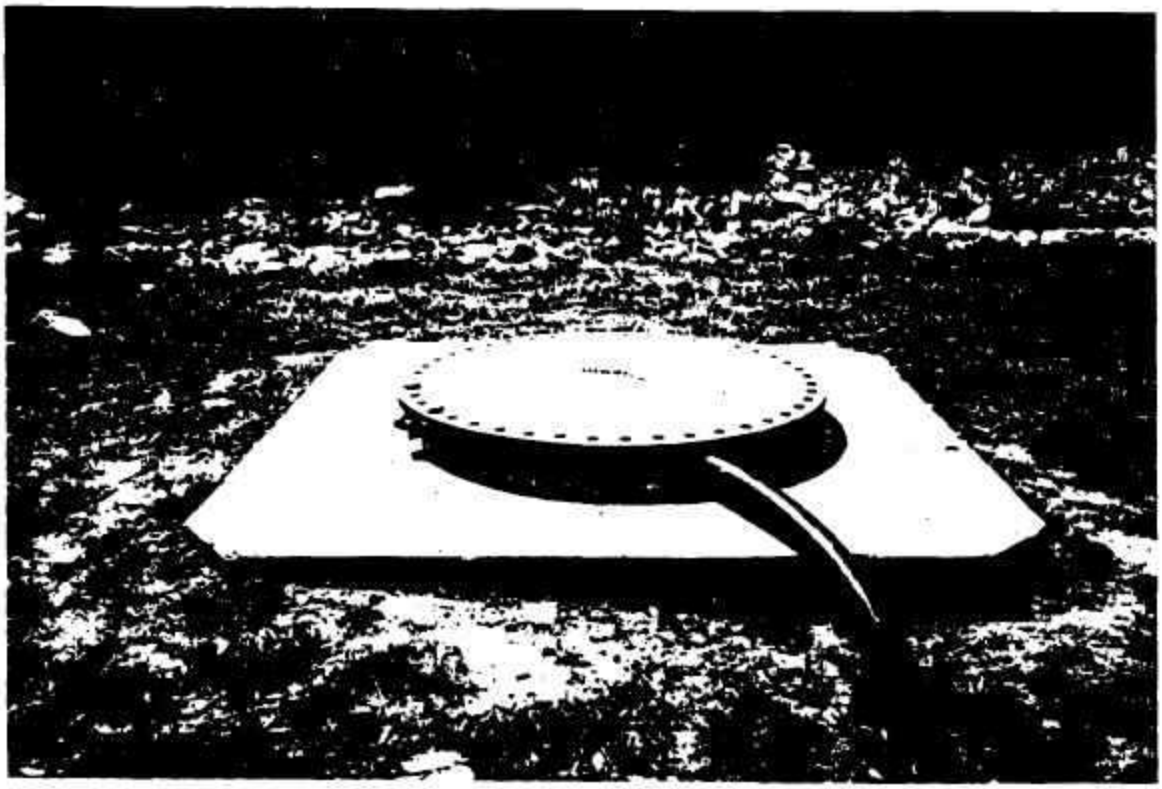
Photograph No. 3 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Vapor phase carbon adsorption unit located outside the treatment building. Note sampling ports (upper right) on the unit used to monitor carbon usage breakthrough.



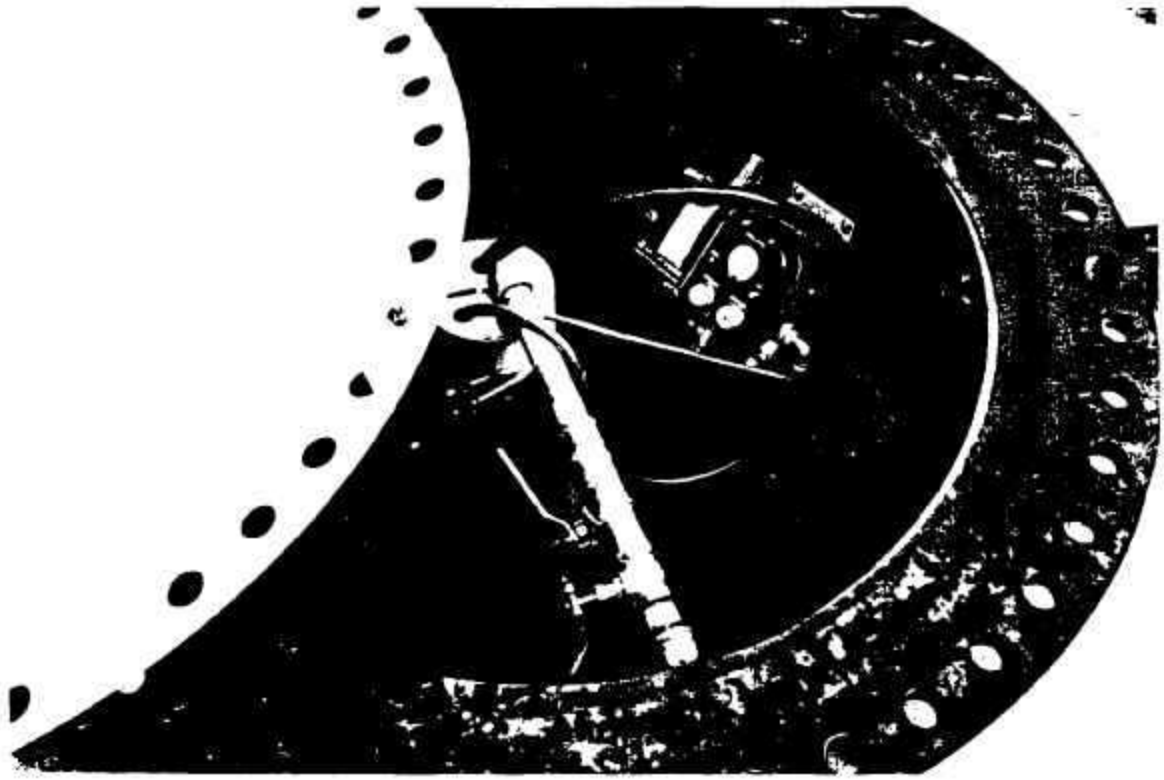
Photograph No. 4 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: View of the air stripping unit, pumps, and controls inside the treatment building.



Photograph No. 5 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: View of the remote monitoring system (Chatterbox) that transmits a voice message to the operator's telephone in the event of an upset condition.



Photograph No. 6 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: View of a groundwater extraction well. Well vaults are covered and locked to prevent unauthorized access.



Photograph No. 7 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Inside an extraction well vault. Control box on right regulates the necessary air supply for downhole pneumatic pumps.

Photograph No. 8 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Access road following the alignment of withdrawal wells WW-1 through WW-4 along the south edge of the contaminant plume.

Photograph No. 9 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Discharge point for overflow treated effluent into Perdido Creek approximately 1800 feet east of the treatment facility.

Photograph No. 10 **Date:** March 6, 1995
Location: Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama
Description: Observation well (OW-39) being purged prior to sampling during one of the quarterly monitoring events.

APPENDIX C

SITE DOCUMENTATION

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
Bureau of Waste Management
P. O. Box 8550
Harrisburg, PA 17105-8550
OFFICIAL PENNSYLVANIA MANIFEST FORM

FOR SHIPMENT OF HAZARDOUS, INFECTIOUS AND CHEMOTHERAPEUTIC WASTE.

Form approved. / OMB No. 2050-0039 Expires 9-30-92

ER-WM-51 REV. 1/91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: A D L 9 8 0 7 2 8 7 0 3
Manifest Document No.:

2. Page 1 of 1

Information in the shaded areas is not required by Federal law but is required by State law.

3. Generator's Name and Mailing Address: CSX Transportation
500 Water Street, SC J275
Jacksonville, FL 32202
SITE: 53741 Lister Lane
Perdido, AL 36562
(205) 479-6500

4. Generator's Phone (904) 359-1590

A. State Manifest Document Number: PAC 7900340

B. State Gen. ID:

5. Transporter 1 Company Name: Allwaste Services of Atlanta Inc

6. US EPA ID Number: G A D 9 8 4 2 7 9 6 6 1

C. State Trans. ID: PA-

7. Transporter 2 Company Name:

8. US EPA ID Number:

D. Transporter's Phone ( )

E. State Trans. ID: PA-

9. Designated Facility Name and Site Address:
Envirtrol, Inc.
24th Street Ext. & 31st Street
Beaver Falls, PA 15010

10. US EPA ID Number: P A D 9 8 0 7 0 7 0 8 7

F. Transporter's Phone ( )

G. State Facility's ID

H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Hazardous Waste Solid N.O.S. (Spent Activated Carbon contains Benzene), 9, NA 3077, PG III	1	C M	1 2 5 0 0	P	U 0 1 9
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above

	Lab Pack	Physical State		Lab Pack	Physical State
a.		S	c.		
b.			d.		

K. Handling Codes for Wastes Listed Above
a. S01, T18, Activated Carbon reactivation/recycling for beneficial reuse. Exempt as resource recovery.
b.

15. Special Handling Instructions and Additional Information

Emergency Phone Numbers: (205) 479 6500 contact Clyde Hopkins
205 304 6333 Beeper
Riedel-Peters Env. Svcs.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Month	Day	Year
D C HARVILLE	D C Harville	07	30	94

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
H.W. Copeland		07	30	94

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year

GENERATOR — TRANSPORTER — FACILITY

EPA Form 8700-22 (Rev. 9/88) Previous editions are obsolete

Site Review And Update

PERDIDO GROUNDWATER CONTAMINATION SITE

PERDIDO, BALDWIN COUNTY, ALABAMA

CERCLIS NO. ALD980728703

SEPTEMBER 30, 1994

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

SITE REVIEW AND UPDATE

PERDIDO GROUNDWATER CONTAMINATION SITE

PERDIDO, BALDWIN COUNTY, ALABAMA

CERCLIS NO. ALD980728703

Prepared by

Alabama Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

SUMMARY BACKGROUND AND HISTORY

The Perdido Groundwater Contamination Site (PGCS) is a National Priorities List (NPL) site located in Perdido, Baldwin County, Alabama (Figure 1). This site includes an area of groundwater contamination that covers approximately eight acres (Figure 2). The contamination was the result of a train derailment that occurred on May 17, 1965 (1). The derailment occurred next to the intersection of County Highway 61 and Railroad Street. Approximately 7,575 gallons of benzene and approximately 6,500 acrylonitrile were released in the 21-car derailment. Some benzene and acrylonitrile infiltrated the soil, and some volatilized into the air. Fire consumed an unknown amount of benzene when a worker using a cutting torch accidentally ignited the derailed cars (2).

The Alabama Department of Public Health (ADPH), Division of Public Water Supply, first documented reports of taste and odor problems in Perdido residents' domestic water wells in December 1981 (3). Subsequently, the testing of two wells in February 1982 confirmed that benzene contaminated the groundwater. In August and September 1982, the ADPH, Division of Solid and Hazardous Waste (ADSHW), sampled twenty-seven additional wells and found six to be contaminated. Acrylonitrile was not detected in any of the wells (9). This prompted the Baldwin County Health Officer to recommend that residents within a one-mile radius of the derailment stop using their domestic wells for drinking and bathing.

In September 1982, the Centers for Disease Control (CDC) met with thirty residents of the community whose wells were contaminated. The CDC measured urinary phenol levels of each of these residents. Urinary phenol levels are used to detect recent exposure to benzene. None of the residents had elevated levels. The lack of urinary phenol was attributed to the fact that benzene is rapidly eliminated from the human body. Perdido residents had stopped drinking from their domestic wells one week before testing (1).

During October 1982, ADSHW and the U.S. Environmental Protection Agency (USEPA) took groundwater samples from forty-nine domestic water wells (3). The sampling results suggested that nine domestic water wells in the Miocene aquifer were contaminated. Consequently, the site was proposed to the National Priorities List (NPL) on December 30, 1982.

In July of 1983, CSX Transportation began supplying an alternate source of water to Perdido residents. All domestic well users within one mile downgradient of the derailment were connected to the Atmore, Alabama municipal water supply system (3). Residents living more than one-mile downgradient were offered an alternate source of water, also. Thirty-seven houses between the one-mile and two-mile radii were provided with municipal water. Residents of four households chose to continue using their domestic wells.

A second possible source of contamination was discovered in 1983. Eight underground storage tanks, located 1,900 feet southwest of the train derailment, were discovered to contain benzene, other volatile organic compounds (VOCs), and large amounts of water. The high water content led investigators to suggest that leakage from the tanks had occurred (1).

The only contaminant of concern for the PGCS is benzene. Benzene is a VOC that volatilizes to the atmosphere or seeps into the soil upon release. In soil, benzene tends to volatilize to the atmosphere or percolate downward into the local groundwater. Benzene is not readily absorbed by plants or animals, but it does dissolve in water. Benzene is a known cancer causing agent in humans, and may cause other adverse health effects (7).

Soil sampling in 1983 indicated that the levels of benzene in the soil at the derailment site varied with depth. The concentration of benzene in surface soils ranged from non-detectable to 12.19 parts per million (ppm) (4). Because the benzene levels were below ATSDR comparison values, surface soils were not considered as a potential exposure pathway (1). Subsurface soils (20 feet below surface) exhibited the highest benzene levels with a maximum concentration of 20 ppm. Since subsurface soils are not an exposure pathway unless they are disturbed, this medium also was eliminated as a potential pathway.

Groundwater samples were taken from the Miocene aquifer during 1983. The Miocene aquifer flows to the southwest, and consists of layers of clays, silts, sands, and gravels. Benzene concentrations in the aquifer ranged from <0.001 to 108 ppm. The groundwater monitoring data also suggested that the contaminant had not migrated more than one mile from the site (Figure 2) (4). Since residents may continue to use their domestic wells, groundwater is considered a potential pathway (1).

Several concerns were expressed by residents in earlier investigations. While all domestic water users within one mile downgradient of the derailment were connected to the Atmore municipal water supply system, some concern was expressed by residents about the use of domestic wells for watering livestock and gardens (1). Also, there was some apprehension expressed by residents about the use of uncontaminated wells, both within the site boundaries and within the one to two mile radii of the derailment. Residents were concerned that these wells could become contaminated and be responsible for contaminating the food chain (1).

The ATSDR Public Health Assessment (PHA) for the PGCS was completed in January 1989. ATSDR classified the site as a potential public health concern, and made the following recommendations.

1. Perform a well use survey to determine if any wells are still in use for watering of livestock or gardens. If the wells are in use, they should be: 1) taken out of service, or 2) monitored on a regular and continuing basis pending groundwater remediation.

2. Monitor the migration of the contaminant plume to learn if remedial actions are successful. If the plume continues to migrate, private drinking water wells that are more than one mile downgradient of the spill site should be monitored.

3. Implement local or state regulations to ensure that no wells are installed in areas of contaminated groundwater, until groundwater remediation is complete.

4. The proposed pump and treat system should be designed and located so that the public will not be exposed to unacceptable levels of benzene in the air.

CURRENT CONDITIONS OF SITE

CSX began construction of a pump and treat facility in 1991. This facility was completed in 1992. The contaminated groundwater is purified by an air stripping and carbon absorption treatment system to extract benzene (Figure 3). The treated groundwater is then reinjected into the aquifer or released through a surface discharge.

The pump and treat facility is located on the old Wolfe property, approximately 800 feet southwest of the derailment site. The plant sits in a meadow that is roughly one acre in size. Trees and shrubs surround the clearing on the south, east, and west. A dirt road runs east-west nearly 300 feet north. A mobile home is located on the property about 600 feet to the south of the facility.

The Perdido groundwater site was visited on May 24, 1994 by Mr. Neil Daniell, geologist, and Dr. Brian Hughes, toxicologist, ADPH. They were accompanied by Mr. David Thompson, environmental engineer, of the Alabama Department of Environmental Management (ADEM). The team assessed the current status of the Perdido remediation system and attempted to find any past, present, or future hazards associated with the site.

Various safety factors have been built into the extraction and injection process. Extraction and injection wells have a subsurface containment receptacle that prevents further contamination of the environment in case of a leak. The receptacle captures any water that may seep from a pump or pipeline connected to the pump. This water is then removed and sent through the treatment process. Following aeration to remove the benzene, the water is reinjected into the aquifer or released through a surface discharge. The contaminated air from aeration is purged through an active carbon filter, and the treated air is released into the environment. Inline detection instruments measure any benzene in the effluent stream of air and water to insure the integrity of the carbon filter.

Several other safety features were observed during the site visit. Signs clearly mark the underground pipelines leading from the wells to the treatment facility so that they are not accidentally severed by utility workers. The remediation plant is enclosed by a fence to prevent unauthorized access. Also, all extraction wells, injection wells, and monitoring wells are locked so that the wells cannot be used for other purposes. The site is apparently free from any physical hazard.

The train derailment area was visited to find out if possible hazards exist in that section. Vegetation appeared normal, and no evidence of the derailment was noted. A railroad spur has been added along the track where the derailment occurred.

The area where the underground storage tanks are located did not appear to be disturbed. Previous investigations had shown the tanks to be a second possible source of contamination. However, current data are inconclusive. According to an official from Riedel-Peterson Environmental Services (10), the tanks have not been removed.

Table 1 contains the benzene sampling results from December 1992 to March 1994 (8)(3). This data redefines the shape of the plume and increases its size (Figure 4). The plume of contamination is currently estimated to be 15 acres, and extends further east, west, and north than previously suggested (2).

Several errors have been noted in previous studies of the PGCS that may have lead to inaccuracies in determining the extent of the plume. Monitoring wells OW-33, OW-34, OW-35, and OW-38 are shown on the most recent maps of the site in locations that differ from those on earlier maps (Compare Figures 2 and 3 to see the differences in position.). The size of the plume changes significantly when these errors are corrected (Figure 4).

One other inconsistency was noted while reviewing the PGCS groundwater data. In the 1989 PHA, a well along Highway 47 South was reported to be contaminated with benzene. This well was previously reported to be uncontaminated in Figure 2-2 in the 1983 NUS Geophysical Study of the PGCS (Figure 5) (6). The new data clearly suggest that the well was contaminated; however, the December 1991 ENSR Remedial Design Report does not include the well within the plume boundary. Thus, it is believed that the extent of the plume may expand beyond the area currently under remediation (Figure 4).

Data gaps exist for the PGCS. While data have been collected on the withdrawal wells and some monitoring wells located within the plume, none have been collected from most of the perimeter wells. The sampling data available from the few wells along the edge of the plume indicate that more samples should be taken at the perimeter of the plume.

CURRENT ISSUES

Many recommendations made by ATSDR in the 1989 PHA are still valid. For example, the number of private wells being used for watering livestock and gardens has not been determined. Furthermore, no data exist for previously uncontaminated wells that may have become contaminated. Current data suggest that wells located within a one- to two-mile radius of the derailment probably have not become contaminated. However, with the absence of groundwater data from the southern extent of the plume, it is probable that residents could become exposed to benzene.

A newly identified concern is that residents within the plume boundary may still be using their domestic wells. According to an official at the Perdido Water Board, some residents are using their domestic wells for drinking, and other purposes such as washing cars, watering livestock, and gardens (5). These residents may be exposed through multiple exposure

pathways to levels of benzene that could cause adverse health effects. Also, there are no local or state regulations to prevent new wells from being installed in the area (5).

CONCLUSIONS

Groundwater monitoring wells have been sampled quarterly to observe the migration of the contaminant plume. However, most of the wells monitored were located within the plume. Monitoring wells located east and west of the plume have not been sampled within the last three years. These wells should be monitored to obtain more accurate information than was presented in the previous reports. This will help verify the extent of the plume's migration, if any, and determine the effectiveness of remedial actions. If the contaminant plume does extend further, additional remediation efforts may be needed to confine the groundwater contamination.

The data is insufficient to determine if the eight underground storage tanks are a possible source of contamination. Presently, the underground tanks have not been removed.

The pump and treat system is located in an area where it presents little risk to the Perdido residents. The facility does have safeguards to prevent exposure from leakage. Also, safety measures have been installed to prevent cutting of underground pipelines.

A well use survey has not been conducted nor have state and local regulations been enacted to document or prevent private well use in the area. It is likely that residents are being exposed to benzene since reports suggest that wells are being used for drinking water and other purposes. However, no data exist to learn if, or to what extent, exposure is occurring.

RECOMMENDATIONS

1. Perform a well survey to determine the number of wells within the site boundary, and the purpose for which they are being used.

2. Upon completion of the well survey, perform a health consultation to assess any possible exposure from the use of domestic well.

3. Educate the residents in the Perdido area about the adverse health effects that may be caused by benzene exposure.

4. Sample monitoring wells OW-6, OW-15, OW-2, OW-4, OW-33, OW-5, OW-38, OW-25, OW-22, OW-40, OW-9, OW-29 to determine the extent of the plume. If these wells are not contaminated, then those nearer the plume boundary should be sampled to determine the exact extent of the plume.

5. Install a monitoring well approximately 300 feet east of monitoring well OW-38 to figure out the extent of the plume in this area. Sampling data from well

OW-38 suggests that the plume extends further east in this area. Also, install a monitoring well approximately 400 feet east of OW-25 to insure that the contamination has not migrated further south in this region (Refer to Figure 4). we suggest that residents not use these wells until more extensive sampling is conducted.

6. Residents located within a one- to two- mile radius of the derailment should not use their domestic wells until more extensive sampling is conducted.

7. Local or state regulations should be implemented to insure that new wells are not installed within the plume boundary until groundwater remediation is complete.

Health Activities Recommedation Panel (HARP) Recommendations

The data and information developed in the site review and update of the Perdido Groundwater Contamination site have been evaluated by the ATSDR Health Activities Recommedation Panel (HARP) for follow-up activities. The panel offers the following recommedations.

1. Community health education should be provided to the potentially exposed populations about the possible adverse health effects of benzene.

2. Based on the well survey and exposure assessment, a list of residents should be forwarded to ATSDR's Division of Health Studies for inclusion on the benzene registry.

Public Health Actions

The following Public Health Action Plan (PHAP) for the Perdido Groundwater Contamination site contains a description of actions to be taken by ATSDR and/or ADPH at and in the vicinity of the site subsequent to the completion of the site review and update. The purpose of the PHAP is to ensure that the site review and update not only identifies potential public health hazards (or public health hazards based upon the well survey), but provides a plan of action designed to mitigate and prevent adverse health effects resulting from exposure to hazardous substances in the environment. The following public health actions will be implemented by ATSDR and/or ADPH.

1. ATSDR, in cooperation with ADPH, will evaluate the feasibility of a site-specific health education program designed to acquaint the community with the possible adverse health effects of benzene.

2. ADPH will conduct a well survey to determine the number of wells within the site boundary, and the purpose for which they are being used.

3. Upon completion of the well survey, ADPH will evaluate the feasibility of conducting groundwater sampling from domestic drinking water wells within the plume.

4. Upon completion of the well survey and exposure assessment, ADPH, in cooperation with ATSDR, will evaluate the feasibility of conducting biological testing of residents.

5. Based on the well survey and exposure assessment, ADPH will forward a list of residents to ATSDR’s Division of Health Studies as potential canidates for inclusion on the benzene registry.

DOCUMENTS REVIEWED

1. Agency for Toxic Substances and Disease Registry. Public Health Assessment for the Perdido Groundwater National Priorities List (NPL) Site. Atlanta. January 1989.

2. United States Environmental Protection Agency, Region IV. Facts Sheet. Perdido Groundwater Contamination Superfund Site, Perdido, Alabama. May 1993.

3. ENSR Consulting and Engineering. Remedial Design Report for Perdido Groundwater Contamination, Perdido, Alabama. December 1991.

4. P.E. LaMoreaux and Associates. An evaluation of the occurrence of benzene in groundwater, Perdido, Alabama. December 1983.

5. Telephone Communication with Perdido Groundwater Board. June 1994.

6. NUS Corporation, Superfund Division. Geophysical Study of the Perdido Groundwater Contamination Site, Perdido, Alabama. May 1983.

7. Agency for Toxic Substances and Disease Registry (ATSDR). Toxilogical profile for benzene. Atlanta. 1993.

8. ENSR consulting and Engineering. Quarterly Reports on the Treatment System Operation and Maintenance and Performance for the Perdido Groundwater Contamination Site, Perdido, Alabama. 1993.

9. ERT consulting. Perdido Groundwater Contamination Site Remedial Investigation Report. August 1986.

10. Personal communication with Mr. Clyde Hopkins of Riedel-Peterson Environmental Services. May 1994

PREPARERS OF REPORT

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Appendix A

Figures

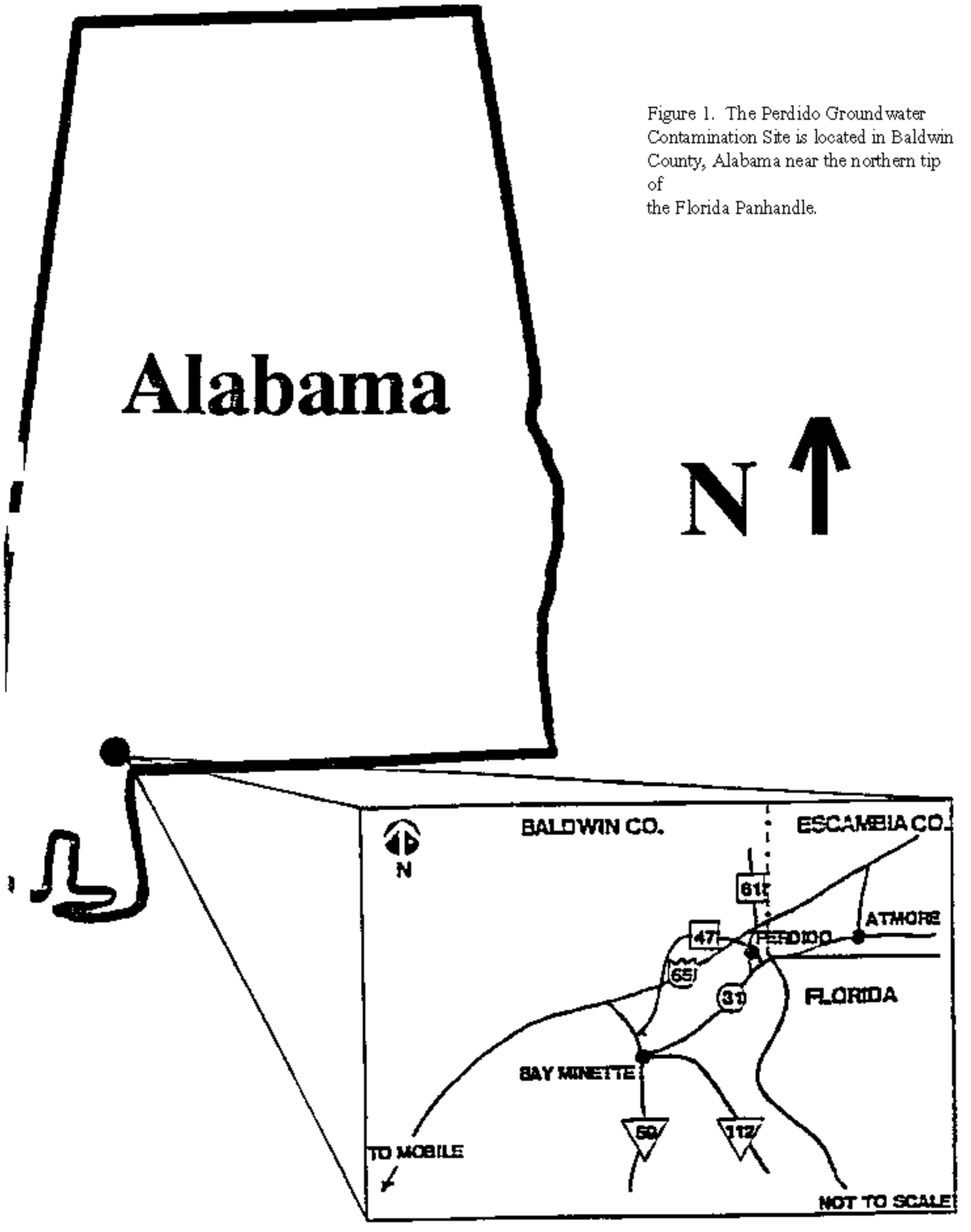
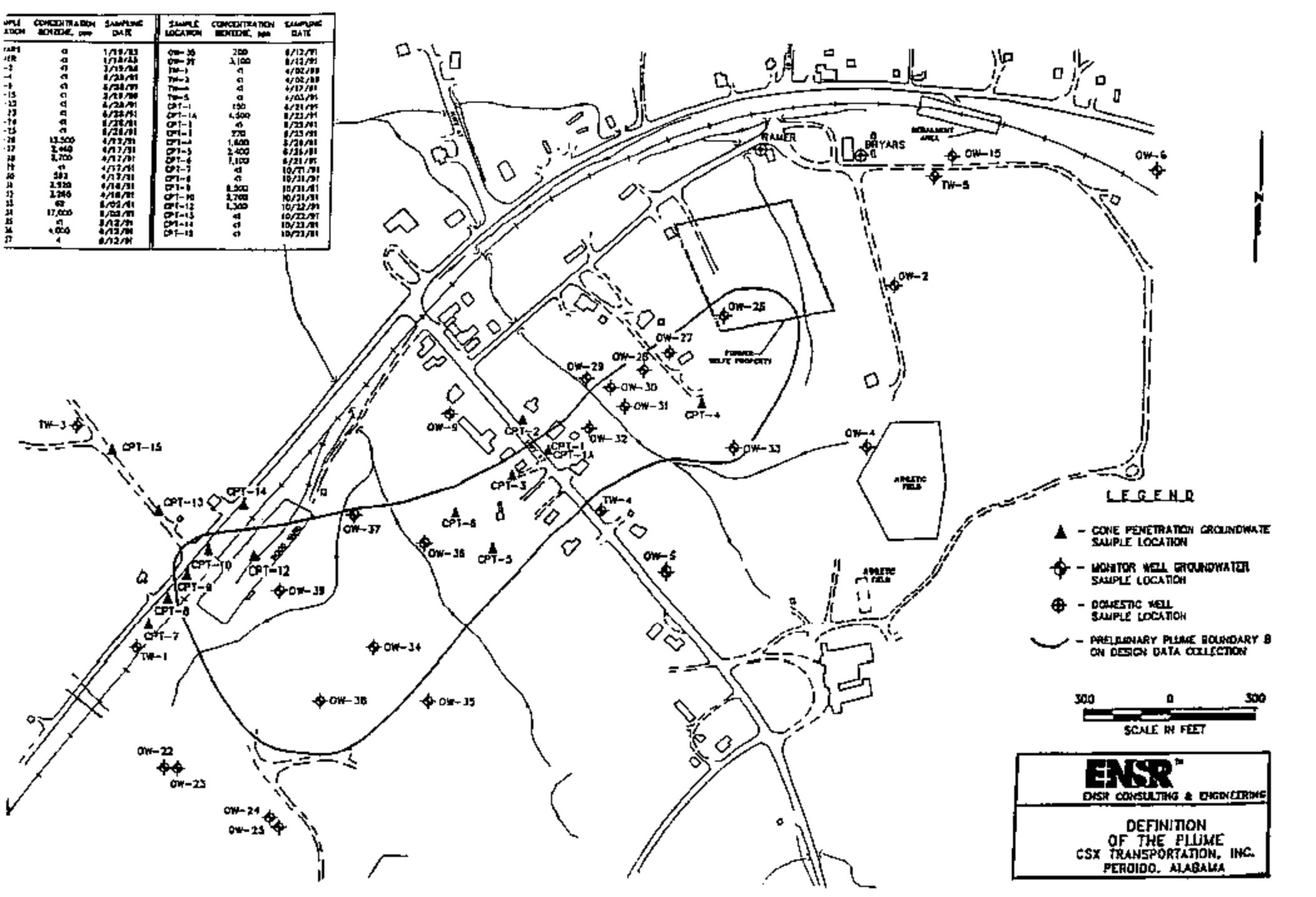


Figure 1. The Perdido Groundwater Contamination Site is located in Baldwin County, Alabama near the northern tip of
the Florida Panhandle.


LEGEND
▲ – CONE PENETRATION GROUNDWATE SAMPLE LOCATION
– MONITOR WELL GROUNDWATER SAMPLE LOCATION
– DOMESTIC WELL SAMPLE LOCATION
– PRELIMINARY PLUME BOUNDARY B ON DESIGN DATA COLLECTION
300 0 300
SCALE IN FEET
ENSR
ENSR CONSULTING & ENGINEERING
DEFINITION OF THE PLUME
CSX TRANSPORTATION, INC.
PERDIDO, ALABAMA
RAMER
BRYARS
BERMUDA AREA
FORMER WHITE PROPERTY
ATHLETIC FIELD
TW-1
TW-3
TW-4
TW-5
OW-2
OW-4
OW-5
OW-6
OW-9
OW-15
OW-22
OW-23
OW-24
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OW-37
OW-38
OW-39
CPT-1
CPT-1A
CPT-2
CPT-3
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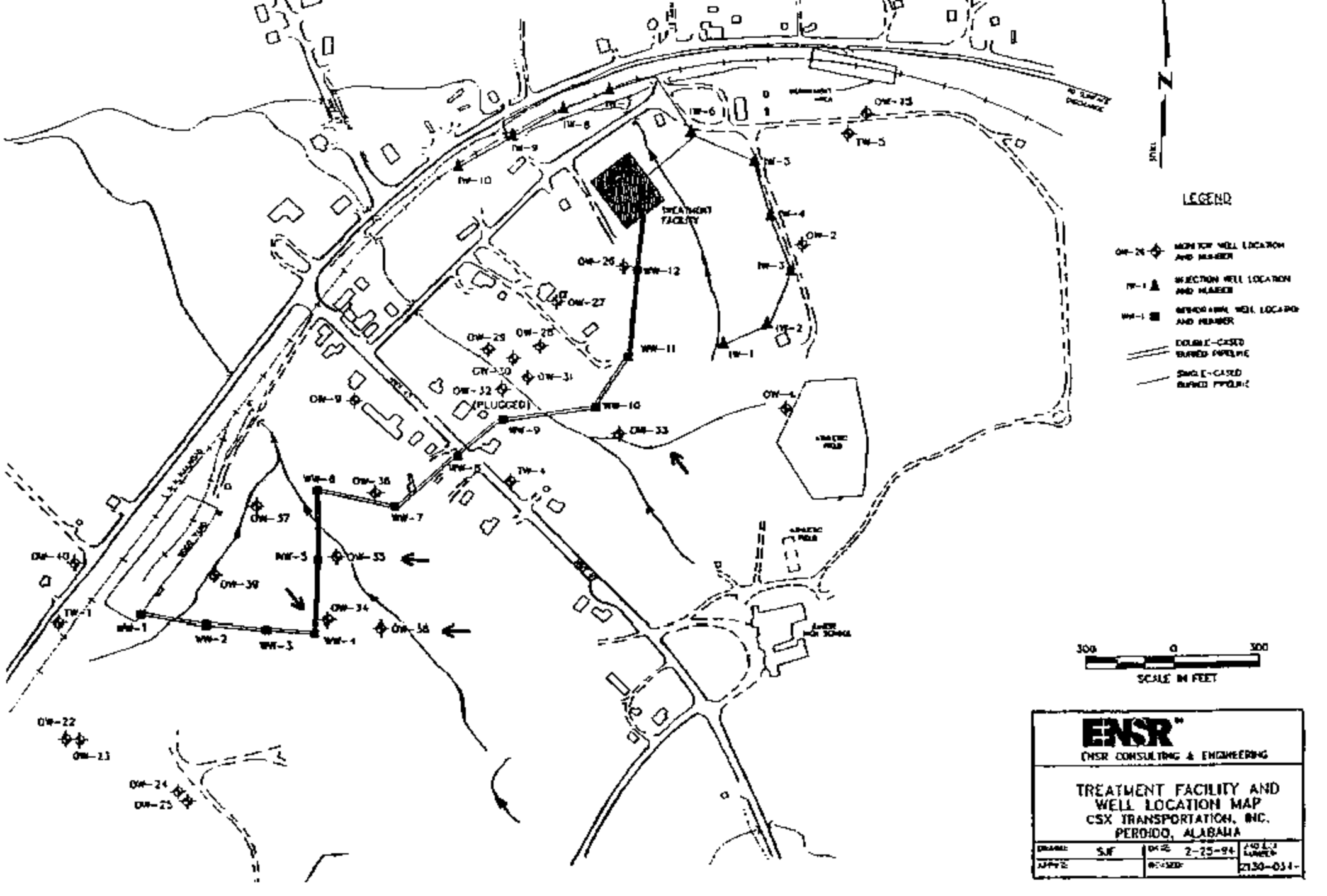
CPT-14
CPT-15



ENSR
ENSR CONSULTING & ENGINEERING

TREATMENT FACILITY AND WELL LOCATION MAP
CSX TRANSPORTATION, INC.
PERDIDO, ALABAMA

DRAWN:	SJF	DATE: 2-25-94	APD & LD NUMBER: 2130-034-
APPVD:		SCALE:	

Appendix B

Groundwater Sampling Data

Table 1. Groundwater sampling data from the PGCS. Benzene levels are in parts per billion.

Well	12/02/92	12/03/92	12/04/92	12/05/92	12/06/92	12/08/92	12/11/92	12/24/92	01/15/93	01/18/93	02/19/93	12/21/93	03/22/94
IW-6		33	140				640	11000	6700		3500		
WW-1	440	780	2000	2100	4900	3500							
WW-2	380	360	1400	1500	250	1200							
WW-3	1200	1700	1400	1400	2000	610							
WW-4	190	13000	1400	4900	5600	4700							
WW-5	2700	3800	2100	2300	1800	1200							
WW-6		6		1600	50	3							
WW-7	2	3	4	22	19	36							
WW-8	<1	<1	<1	<1	<1	<1							
WW-9	2	3	<1	<1	<1	4							
WW-10	<1	<1	4	<1	2	3			4				
WW-11	<1	<1	<1	<1	<1	<1							
WW-12	5	7	9	180	410	91							
OW-6							2	12					
OW-15							4	20			2		
OW-23												0	1
OW-26				12000			8500	9600	6700		8700	7800	5000
OW-28				300			34	780	390		640	1000	1900
OW-30												14000	9900
OW-32				280			4	740	2500		5100		
OW-33				0			0	0	1		0	2	2
OW-36			70				130	250	47		32	330	170
OW-37			0				0	0	5		0	0	0
OW-38			2				2	35	14		210	290	1700
OW-39			60				550	310	140		3600	880	1400
OW-40			0					24	3	30	12	0	4

APPENDIX D

EPA-ESD REGION IV FIELD OVERVIEW CHECKLIST

INTRODUCTION

This document is the Administrative Record and Index for the Explanation of Significant Differences for the Perdido Groundwater Contamination Site, National Priorities List (NPL) site, Perdido, Baldwin County, Alabama.

The Administrative Record is available for public review at EPA Region IV's office in Atlanta, Georgia, and at the Perdido Water Board, Route 1, Box 3A, Perdido, Alabama. The previous Administrative Record is available for public review at EPA Region IV's office in Atlanta, Georgia, and at the Bay Minette Public Library, 119 West 2nd Street, Bay Minette, Alabama.

This Administrative Record includes, by reference only, all documents included in the previous Administrative Record for this site, which is available for review at the aforementioned repositories.

Questions concerning the Administrative Record should be addressed to the EPA Region IV Remedial Project Manager for the Perdido Groundwater Contamination Site National Priorities List (NPL) Site.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

ALD980728703

PERDIDO GROUNDWATER CONTAMINATION SITE ESD

NPL Site

Administrative Record

Volume 1
&

Index

Region IV
Waste Management Division
U.S. Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

[illegible] STREET N.E.

[illegible]

4WD-SSRB

MEMORANDUM

DATE: December 2, 1994

SUBJECT: Explanation of Significant Differences
Perdido Groundwater Contamination Superfund Site Perdido, Baldwin County, Alabama

FROM: Kimberly Q. Lanterman KQL
Remedial Project Manager

TO: Debbie Jourdan
Administrative Records Coordinator

On May 21, 1993, pursuant to Section 300.435(c)(2) of the National Contingency Plan (the NCP) and the Interim Final Guidance on Preparing Superfund Decision Documents, OSWER Directive 9335.3-02 (October 1989), the Regional Administrator, United States Environmental Protection Agency, Region IV, issued an Explanation of Significant Differences (ESD) to the remedy selected in the Record of Decision (ROD), dated September 30, 1988, for the Perdido Groundwater Contamination Site, Perdido, Baldwin County, Alabama. Section 300.825(a)(2) of the NCP requires that the ESD and all documents forming a basis for the ESD be placed in the administrative record for the Site. Accordingly, please place a copy of the ESD, all documents forming a basis for the ESD, and this memorandum in the administrative record located at the U.S. EPA Records Center, Ground Floor, 345 Courtland Street, N.E., Atlanta, Georgia and at the Perdido Water Board, Route 1 Box 3A, Perdido, Alabama 36562.

PERDIDO GROUNDWATER CONTAMINATION SITE ESD
NPL SITE ADMINISTRATIVE RECORD

Table of Contents

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET. N E
ATLANTA GEORGIA 30365

Site: Perdido
Break: 7+5.J
Other: ESD 12

REF: 4WD-SSRB

Kenneth W. Richardson, Jr., P.E.
Senior Manager Environmental
Safety, Quality & Environment
CSX Transportation
500 Water Street
Jacksonville, Florida 32202

RE: Perdido Ground Water Contamination Superfund Site
Review of Proposal for Temporary Surface Water

Dear Mr. Richardson:

This office has reviewed your request (dated January 7, 1993) for a modification to the current treatment system at the Perdido Ground Water Contamination Superfund site via addition of a surface water discharge pipe.

Since the National Contingency Plan (NCP) exempts Superfund sites from the requirement to obtain permits for actions occuring on-site, application for a National Pollutant Discharge Elimination System Permit (NPDES) is not required. However, you must meet the substantive requirements of the NPDES Permitting program. These requirements were obtained from the Alabama Department of Environmental Management and are as follows:

- Monitor and report flow
- Measure influent and effluent bi-weekly for Iron, Benzene, pH, Suspended Solids and Flow during the first month; weekly for the second and third months; and monthly thereafter
- Discharge limits:

pH	4.5 - 7.5
Benzene	5.0 ppb
TSS	50 ppm
Iron	1 ppm

- Installation of a control valve between the injection pump and the filters
- Installation of a water level recorder in well OW-6 or OW-1
- Abandon and plug old wells that are not currently in use
- Submit site map that identifies the exact location of the discharge point (specifically, distance from the Church and house located in the immediate vicinity of the anticipated discharge point)

You must coordinate your efforts in meeting this requirements with the appropriate State official (please send me a copy of all communications).

Because this request does not fundamentally change the remedy, you may initiate the appropriate actions to facilitate these modifications. Please provide a schedule tasking out the anticipated activities as well as the expected time frame for these activities on or before **close of business on March 4, 1993.**

If there are any problems meeting this date, please contact me as soon as possible at (404)347-2643.

Sincerely,

Cheryl W. Smith
Remedial Project Manager
South Superfund Remedial Branch

cc: Joe Downey, ADEM
Glenda Dean, ADEM

VIA FAX [redacted] RAAJ PATEL

TO: [redacted]	FROM: D.C. HANVILLE
DATE: 2-28-95	1 of Pages
COMPANY: RIGDEL PETERSON	DEPT: PERDIDO ALA
FAX #:	

FAXED to KEN E RAAJ 2-28-95

CSXT PERDIDO, ALABAMA SITE

TREATMENT PLANT ~~WEEKLY~~/MONTHLY LOG EMF-8/9

Reporting Month: ~~FEB~~ FEb Date 2-28-95

Inspected By: D.C.H Hours worked without safety incident

Health & Safety Review Attended by: D.C.H C Hopkins

Flow Meter Reading (Gallons Treated to Date):

Injection 67,371,700 + Surface 42,617,800 = Total 109,989,500

Gallons Treated This: ~~Week~~/Month 106,034,300

Flow Rates: Month - 180 To Date - 180

Down Time: This Month - 40 HRS Average/Month - 25 HRS

Withdrawal Well Pumping Rates (GPM) Total 180

15	15	15	15	15	15	15	15	15	15	15	15
WW1	WW2	WW3	WW4	WW5	WW6	WW7	WW8	WW9	WW10	WW11	WW12

Filter Bags Changed: Month 2-17-95 Dates: 2-17-95

Across Filter: 12 PSI

Carbon Saturation Indicator Purple or Brown at Blower, Purple or Brown at Norit Unit

Remarks: CHECHED recirculate withdrawer 2-28-95 OK

Vapor Phase Carbon in service since, Date - 5-3-94 ANTICIPATE CHANGE IN 95

First Aid Box Checked: Date - 2-28-95 Status - OK

Maxistrip Pressures:

25	25	25	25	25	25	25	0	25
1	2	3	4	5	6	7	8	9

Maintenance/Repair this week/month: CLEAN SAND FROM STRIPPERS &

Major Event: HOLDING TANKS PRE VALVE AT POINT SAMPLES PLACE

Visitors: JERRY FROM EJECTORSYSTEMS WAS HERE IN ALL MW WELLS

Remarks: SYSTEM RUNNING FINE Signature: D.C. HANVILLE

cc: CSXT Remedial Action Coordinator - Mr. Ken Richardson
ENSR Project Manager - Mr. Raaj Patel
Site File

CSX
TRANSPORTATION
Safety, Quality & Environment

7 2 0001

500 Water Street
Jacksonville, FL 32202

January 14, 1993

Ms. Cheryl Smith
Mr. Joe Downey
Mr. Raaj Patel

The enclosed sampling plan and analytical data table summaries may prove useful for tracking the progress of the treatment system at Perdido, AL. These datatables are not intended to replace copies of analytical lab data, which will be sent as required by the Consent Decree. As new data is received, I will update the datatables for you. I suggest placing this information in a 3-ring binder for ready reference. If I sent an earlier set of datatables, you should discard that earlier set of data tables , as this complete package is a stand-alone replacement.

Should you have any questions or concerns, please call me in Jacksonville, FL, at (904) 359-1590.

Sincerely,

Kenneth W. Richardson, Jr., P.E.
Sr. Mgr. Environmental

RAAJ - PATEL

TO: [redacted]	FROM: D.C. HANVILLE
DATE: 3-6-95	1 of Pages
COMPANY: [redacted] PERDIDO ALA	DEPT:
FAX #: [redacted]	

FAXED 10 ITEMS
RAAJ
3-6-95

CSXT PERDIDO, ALABAMA SITE

TREATMENT PLANT WEEKLY/~~MONTHLY~~ LOG EMF-8/9

Reporting Month: MAR Date 3-6-95

Inspected By: DCH Hours worked without safety incident 100 0/0

Health & Safety Review Attended by: D.C. HANVILLE C. Hopkins

Flow Meter Reading (Gallons Treated to Date):

Injection 68,137,900 + Surface 43,093,700 = Total 111,231,600

Gallons Treated This: (Week)/~~Month~~ 1,958,000

Flow Rates: Month - 180 To Date - 180

Down Time: This Month - 40 HRS Average/Month - 25 HRS

Withdrawal Well Pumping Rates (GPM) Total 180

15	15	15	15	15	15	15	15	15	15	15	15
WW1	WW2	WW3	WW4	WW5	WW6	WW7	WW8	WW9	WW10	WW11	WW12

Filter Bags Changed: Month 3-1-95 Dates: 3-1-95

Across Filter: 12 PSI

Carbon Saturation Indicator (Purple) or Brown at Blower, (Purple) or Brown at Norit Unit

Remarks: CHECKED MONTHLY WITH DRAGER TUBE 3-4-95 OK

Vapor Phase Carbon in service since, Date - 5-3-94 ANTICIPATE CHANGE 95

First Aid Box Checked: Date - 3-6-95 Status - OK

Maxistrip Pressures:

25	25	25	25	25	25	25	0	25
	2	3	4	5	6	7	8	9

Maintenance/Repair this week/month: PAT CHECK VALVE IN WW (1)

Major Events: ATI WAS HERE AIR SAMPLING 2-23-95

Visitors: NA

Remarks: SYSTEM IS RUNNING FINE Signature: D.C. HANVILLE

cc: [redacted] Remedial Action Coordinator - Mr. Ken Richardson
ENSR Project Manager - Mr. Raaj Patel
Site File

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

Facility/Site Name Perdido Groundwater Contamination Superfund Site

Address Perdido, Baldwin County, Alabama

Project No. 04400-059-094-0005

EPA ID No. 59-4759

Facility Contact D.C. Harville (Riedel-Peterson) Phone No. (904)973-2611

Overview Personnel Ralph P. McKeen (WESTON) Date March 6-7, 1995

State/Contractor Project Leader Clyde Hopkins

Affiliation Riedel-Peterson (PRP Contractor) Phone No. (205)479-6500

Address 3536 Desirrah Drive
Mobile, Alabama 36618

Sampling Personnel Ricky Hagendorfer & Roger Yawn
Analytical Technologies, Inc. Pensacola, Florida
Other Personnel and Affiliation NA

Type of Study? Analysis of benzene organics in groundwater

Study plan issued? Yes **Date**

Study plan reviewed by ESD? NA Acceptable?

Was study plan followed? _X_ Yes ___ No

Comments

Was a safety plan prepared for the study? _X_ Yes ___No

Was the safety plan adequate? _X_ Yes ___No

Comments

Was the safety plan followed? _X_ Yes ___No

Comments

Additional Comments of Information

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

Checklist sections completed for this overview: 1 X 2 X 3 4 5 6
Key: 1 General Procedures; 2 Groundwater Sampling; 3 Soil, Sediment Sampling; 4 Surface Water Sampling; 5 Waste Sampling; 6 Monitoring Well Installation

SECTION 1 - GENERAL PROCEDURES - SAFETY, RECORDS, QA/QC, CUSTODY. ETC.

1) Type of Samples Collected? 2-40mL VOAs

2) Were sampling locations properly selected? X Yes No

Comments Well cluster IT-1 sampled because of past history of contaminants.

3) Were sampling locations adequately documented in a bound field log book using indelible ink?

X Yes No

Comments

4) Were photos taken and a photolog maintained? Yes X No
Photos taken by WESTON for 5-Year Review Report

5) What field instruments were used during this study? YSI Model 33 S-C-T conductivity and temperature meter; Orion pH meter model 250A; 2-inch Redi-Flo Grundfos pump.

6) Were field instruments properly calibrated and calibrations recorded in the bound field log book?

X Yes No

7) Was sampling equipment properly wrapped and protected from possible contamination prior to sample collection? X Yes No

8) Was sampling equipment constructed of Teflon, glass. or stainless steel? Teflon bailers.

9) Were samples collected in proper order? (least suspected contamination to most contaminated?)

X Yes No

10) Were clean disposable latex or vinyl gloves worn during sampling? X Yes No

Comments

11) Were gloves changed for each sampling station? X Yes No

Comments

12) Was any equipment field cleaned? X Yes No

13) Type of equipment cleaned? 2-inch pump with tubing

14) Were proper field cleaning procedures used? X Yes No

Comments potable water, liquinox, 2-propanol, and DI rinse

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

15) Were equipment rinse blanks collected after field cleaning? _X_ Yes ___No

Comments

16) Were proper sample containers used for samples? _X_ Yes ___ No

Comments

17) Were split samples offered to the facility owner or his representative? ___Yes _X_ No

Comments PRP collecting samples.

18) Was a receipt for samples form given to facility representative? ___Yes _X_ No

19) Were any duplicate samples collected? _X_ Yes ___ No

Comments One per day.

20) Were samples properly preserved? _X_ Yes ___ No

Comments VOAs preserved with HCL

21) Were preservative blanks utilized? _X_ Yes ___ No

Comments

22) Were field and /or trip blanks utilized? _X_ Yes ___No

Comments

23) Were samples adequately identified with labels or tags? _X_ Yes ___ No

Comments

24) Were samples sealed with custody seals after collection? ___ Yes _X_ No

Comments Samples remained in custody of ATI field technicians to their lab.

25) What security measures were taken to insure custody of the samples after collected? The samples were placed in a cooler with ice and transported by truck to the lab. No packing or shipping was required.

26) Were chain-of-custody & receipt for samples forms properly completed? _X_ Yes ___No

Comments

27) Were any samples shipped to a laboratory? ___Yes _X_ No

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

28) If yes to No. 27, were samples properly Packed? NA

Comments Samples were to be hand delivered, by ATI to ATI's Laboratory in Pensacola, Florida.

29) If shipped to a CLP lab, were Traffic Report Forms properly completed? NA

Comments

30) What safety monitoring equipment, protection, and procedures were used prior to and during sampling? No air monitoring performed. Previous sampling events revealed that no organic vapors present in the breathing zone. Disposable latex surgical gloves were worn during each sampling event.

31) Was safety monitoring equipment properly calibrated and calibrations recorded in a bound field log book?
_X_ Yes ___ No.

Comments

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

SECTION 2- SAMPLING GROUNDWATER WELLS

1) Type of wells sampled? (Monitoring, potable, industrial, etc) Monitoring

2) Were wells locked and protected? _X_ Yes ___ No

3) Were identification marks and measurement points affixed to the wells? _X_ Yes ___ No

Comment

4) What were the sizes and construction materials of the well casing? All monitoring well were 2-inch stainless steel.

5) Were the boreholes sealed with a concrete pad to prevent surface infiltration? _X_ Yes
___ Yes

Comments

6) Was there a dedicated pump in the well? ___ Yes _X_ No

Comments

7) Was clean plastic sheeting placed around the wells to prevent contamination of sampling equipment and containers? _X_ Yes ___ No

8) Were total depths and depths to water determined before purging? _X_ Yes ___ No

9) What device was used to determine depths? Water level indicator

10) Were measurements made to the nearest 0.01 ft? _X_ Yes ___ No

11) Was the measuring device properly cleaned between wells? _X_ Yes ___ No

Comments

12) Was the standing water volume in each well determined? _X_ Yes ___ No

13) How was the volume determined? One water volume: (water column height) (6-inch borehole diameter factor)

14) Was a sufficient volume purged prior to sampling? _X_ Yes ___ No

Comments

15) How many volumes? Over 3 volumes were purged.

16) How was the purged volume measured? A 1 gallon bucket measured with a stop watch at approximately 2.5 gallons per minute.

EXHIBIT 1

REGION IV ESD FIELD OVERVIEW CHECKLIST

17) What was the method of purging? submersible Grunfos pump

18) Were pH, conductivity, and temperature measurements taken and recorded at least once during each well volume purged? _X_ Yes ___ No

Comments

19) Were pH, conductivity, & temperature readings stable prior to sampling? _X_ Yes ___ No

Comments

20) How many wells were sampled? Upgradient? 10 Downgradient?

21) How were the samples collected? Bailer X Pump Other

22) If pump was used, what type?

Comments

23) If a pump was used, was it properly cleaned before and/or between wells? _X_ Yes ___ No

Comments

24) What were the cleaning procedures? potable water, liquinox, 2-propanol, DI water

Comments

25) Did bailers have Teflon coated wire leaders to prevent rope from coming into contact with water? ___ Yes _X_ No

26) Were bailers open or closed top? Closed top

27) Was clean bailer and new rope used at each well? _X_ Yes ___ No

Comments

28) Were samples properly transferred from the sampling device to the sample containers? (i.e., purgeable sample first-not aerated, etc.) _X_ Yes ___ No

Comments

29) Was pH of preserved samples checked to insure proper preservation? ___ Yes _X_ No

Comments

30) Were samples iced immediately after collection? _X_ Yes ___ No

31) For what analyses were the samples collected? BTEX

32) If samples were split, what were the sample/station numbers for these? NA

APPENDIX E
STATE CORRESPONDENCE

ADEM
ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

John M. Smith, Director
~~James W. Warr, Director~~

Jim Folsom
Governor

Mailing Address:
PO BOX 301463
MONTGOMERY AL
36130-1463

Physical Address:
751 Cong. W. L.
Dickinson Drive
Montgomery, AL
6109-2608

205) 271-7700
FAX 270-5612

Field Offices:

10 Vulcan Road
rmingham, AL
5209-4702
05) 942-6168
X 941-1603

0 Well Street
O. Box 953
catur, AL
602-0953
5) 353-1713
X 340-9359

04 Perimeter Road
bile, AL
515-1131
5) 450-3400
479-2593

December 7, 1994

Ms. Kimberly Q. Lanterman, RPM
South Superfund Remedial Branch
Environmental Protection Agency
345 Courtland Street, NE
Atlanta, GA 30365

Re: Perdido Groundwater Contamination NPL Site

Dear Ms. Lanterman:

We have reviewed the September 1994 Quarterly Report on the Treatment System Operation and Maintenance and Performance Monitoring for the Perdido Groundwater Contamination Site in Perdido, Alabama. Our comments are as follows:

- We request that any reports or documents that are submitted to EPA also be forwarded to ADEM such as the Groundwater Modeling Results.

- We request that the next quarterly report give an explanation of how the benzene concentrations of the monitoring wells can fluctuate up and down between such a large range of values.

- Attached are comments from the Groundwater Branch of the ADEM Water Division.

If you have any questions regarding these comments please contact me at (205)213-1300.

Sincerely,

David Thompson
Special Projects

cc. David Lovoy, ADEM, Groundwater Branch
Neil Daniel, ADPH

ADEM
ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Jim Folsom
Governor

~~Lee W. Wallace, Director~~
hn M. Smith,
)irector
iling Address:
BOX 301463
1ONTGOMERY AL
6130-1463

hysical Address:
751 Cong. W. L.
inson Drive
itgomery, AL
5109-2608

) 271-7700
270-5612

eld Offices:

Julcan Road
n...ngham, AL
209-4702
942-6168
41-1603

0 Well Street
ox 953
c..ur, AL
602-0953
353-1713
10-9359

)4 Perimeter Road
, AL
1131
5) 450-3400
79-2593

December 8, 1994

MEMORANDUM

Dan 12/9/94

TO: Dan Cooper, Chief
Special Projects

FROM: David M. Lovoy, Hydrogeologist
Groundwater Branch
Water Division

RE: Quarterly Report on the Treatment and Maintenance and Performance Monitoring
Perdido Groundwater Contamination Site
Perdido, Baldwin County
Cerclis No. ALD 980 728 703

DEC 1994
ADEM
SPECIAL PROJECTS

The Groundwater Branch has reviewed the June and September 1994 Quarterly Reports on the Treatment System Operation and Maintenance and Performance Monitoring for the Perdido Groundwater Contamination Site. This review also included the results of the remodeling for the Perdido Groundwater Remediation Site. Based on this review, the following comments and conclusions are given:

1. The next Quarterly Report for the Perdido Site should include an updated listing of all wells associated with the site including: monitoring wells, observation wells, private water wells, piezometers, etc. This list should include the original depth of the well, its current status (in use, not in use, plugged and abandoned), the mean sea level (MSL) elevation of the top of casing or measuring point, the depth to groundwater in each well, screened interval (MSL) and construction material (pvc, stainless steel, etc.). The list should he accompanied by a map depicting the locations of each of the wells in the list.

2. The next quarterly report should include all parameters used to construct and perform the most recent modeling at the site. The next quarterly report should also include results of modeling using the same FLOWPATH model and data used to construct the capture zones over 10, 25 and 50 year periods but using the time period of 2 years since the system has been in operation for only 2 years.

3. The most recent (September, 1994) modeling report notes that the existing capture zones provide adequate containment of the dissolved benzene plume. This statement cannot be confirmed since the horizontal extent of contamination is not known to the northwest, north and southeast. The capture zone scenarios presented in the modeling report do not appear to take into account the fact that the benzene plume is moving as the capture zones are being established.

4. The next quarterly report should include a table noting the pumping rate of the pumping wells and the injection rate of the injection wells.

5. The potentiometric surface at the site does not appear to be altered significantly by the recovery well system. Based on the modeling performed for the site and the quarterly potentiometric surface data and benzene isopleth map, CSX or its consulting firm should indicate its interpretation of the effectiveness of the recovery well system at capturing the benzene plume and any recommendations on improvements/modifications to the recovery system.

6. The benzene isopleth maps generated during this quarter and previous quarters, indicate that the current monitoring well system is not capable of determining the extent benzene in groundwater to the north, northwest and southeast. If the horizontal extent of the benzene plume has not been established, additional monitoring wells should be proposed by CSX in order to determine the full extent of benzene in groundwater.

7. Samples should be taken from all perimeter wells as well as the wells that are typically sampled on a quarterly basis. Wells that detect the presence of benzene should be placed on the list of wells that are sampled quarterly.

CC: David Thompson - Special Projects
Fred Mason - Groundwater Branch

STATE OF ALABAMA
DEPARTMENT OF PUBLIC HEALTH
DONALD E. WILLIAMSON, M.D. • STATE HEALTH OFFICER

February 7, 1995

MEMORANDUM:

TO: Brian J Hughes, PhD.
Environmental Toxicologist

FROM: J. Neil Daniell
Geologist

RE: Perdido Groundwater Contamination Well Survey

In response to recommendations made in the 1994 Site Review and Update for the Perdido Groundwater Contamination site (PGCS), the Alabama Department of Public Health, Risk Assessment Branch, performed a well survey in and around the site in Perdido, Alabama (See Attachments). The study was designed to determine the number of private wells in the area and the purpose for which these wells were being used. Results of the study show that no residents are using private wells within the plume or near its boundaries (See Attachments). Therefore, I question the need for a health consultation at this time.

/nd

APPENDIX F

REMODELING RESULTS

ENSR

ENSR Consulting
and Engineering
3000 Richmond Avenue
Houston, Texas 77098
(713) 520-9900
(713)520-6802 (FAX)

August 24, 1994

Mr. Kenneth W. Richardson, Jr., P.E.
Senior Manager - Environmental
CSX Transportation, Inc.
500 Water Street, SC J275
Jacksonville, Florida 32202

RE: Submittal of Remodeling Results for the Perdido Groundwater Remediation Site in Perdido, Alabama

Dear Mr. Richardson:

Attached please find the above stated submittal prepared by ENSR Consulting and Engineering. As part of performance monitoring of the groundwater treatment systems at Perdido, the FLOWPATH model (the model originally used in the design phase) was re-evaluated. This model was recalibrated after relocating the remediation wells (i.e., withdrawal and reinjection wells) "as installed" and using the most current pumping and reinjection data available for the site.

The attachment provides a detailed step-by-step description of the remodeling process. Based on the remodelling results, the current pumping system is operating at its best capturing the contaminant plume. By increasing and maximizing the pumping rate on withdrawal well WW-3 would enhance the remediation process. ENSR recommends a periodic exercise of remodeling to evaluate the system performance and optimize remediation of the contaminant plume.

Should you have any questions, please give me a call at (713) 520-9900.

Sincerely,

Raaj U. Patel

Raaj U. Patel, P.G.
Program Manager

cc: Perdido Project File

A. Discussion of FLOWPATH Input Parameters

Grid and Well Placement

A new grid was constructed in order to position the withdrawal and injection wells at their current locations. The new grid has 91 rows and 100 columns and as-built well locations. The previous model utilized fewer nodes with only planned locations of withdrawal and injection wells.

Boundary Conditions

The boundary conditions were modified for this model in order to obtain a better approximation of pre-pumping head distribution. As shown in Figure 1, impermeable fixed boundaries were added to the southeast and northwest to establish the pre-pumping flow field. Over one hundred constant head nodes were placed upgradient to the northeast and downgradient to the southwest. The previous model utilized approximately 15 constant head nodes to establish the flow field.

Hydraulic Conductivity

Slug tests performed on installed 2-inch diameter wells in April and October, 1991 showed a log normal mean hydraulic conductivity of 5.2 ft/day (see Monthly Progress Reports for April 1991 and October 1991). The pump test performed in May 1986 on PW-1, the 6-inch diameter well on the former Wolfe property, showed a hydraulic conductivity of 17 ft/day (see Revised Remedial Investigation Report, November 1987). Because of the longer duration of the pumping test, it is considered to provide a more reliable hydraulic conductivity value than the slug tests; therefore, the value of 17 ft/day was used in the FLOWPATH modeling as the input value for K.

Recharge Rates

In order to calibrate the model, the infiltration/recharge rates were changed from the previous model. While the infiltration/recharge rates used in the previous model were correct in theory, they prevented the model from calibrating to actual site conditions with an acceptable water balance error. Since there was no actual data used to confirm those rates, the infiltration /recharge rates were changed to zero for the entire site. This allowed the model to be calibrated to the potentiometric surface map for January, 1983, which provided the largest area to which the model could be calibrated.

Retardation Coefficient

The retardation of benzene relative to groundwater seepage velocity is quantified by the use of a retardation coefficient.

The retardation coefficient for benzene was estimated using the following formula (Dragun, 1988):

$$R = (1 + K_d (D/n))$$

where: R = retardation factor (unitless)
K_d = solid/water partitioning coefficient (vol/mass)
D= bulk dry soil density (mass/vol)
n= total soil porosity

The retardation factor is a value equal to or greater than 1. The inverse of R is multiplied by the average linear groundwater velocity to provide an estimate of the retarded flowrate of a chemical at the point where $c/c_o = 0.5$.

The solid/water partitioning coefficient is defined as:

$$K_d = C_s/C_w$$

where: C_s= concentration of a chemical adsorbed on soil surfaces (mass/mass)
C_w= concentration of a chemical in water (mass/volume)

According to the above equation, K_d values increase with adsorption. One of the major factors controlling K_d values in sediments is the soil organic carbon content (f_{oc}). K_d values which are normalized by f_{oc} can be applied to other soils in which the K_d has not been measured (assuming that similar f_{oc} values and chemical concentrations are present in the second soil). The f_{oc} normalized K_d is defined as follows:

$$K_{oc} = K_d/f_{oc}$$

where: K_{oc}= partitioning coefficient normalized to f_{oc} (volume/mass)

K_{oc} values correlated correlate with a chemical's hydrophobicity as measured by its octanol-water partitioning coefficient, K_{ow} (unitless). Numerous empirical equations have been developed which can be used to estimate K_d values for a chemical in soil by:

- estimating K_{oc} values from equations which use the chemical's K_{ow}
- estimating K_d values by multiplying the estimated K_{oc} by the soil's f_{oc}

The K_d value is then used to calculate an R and the degree of chemical retardation in the groundwater. Table 1 provides a worst-case estimate of the retardation coefficient using values from literature for K_{ow} (Dragun, 1988) and soil bulk dry density (Hough, 1969). The worst-case scenario resulted in 6.77 (rounded up to 7) for the retardation factor for input in the model.

Aquifer bottom elevation:

The basal clay layer underlying the uppermost aquifer beneath Perdido was encountered in several of the borings drilled during the Remedial Investigation, as shown on Table 2. From these results, an aquifer bottom elevation of 140 ft msl was estimated.

B. Discussion of FLOWPATH Modeling

The new FLOWPATH modeling results for the site are discussed below and the figures are presented at the end of this memo.

Calibration of Model

The first procedure was to calibrate the model to steady state conditions before the treatment system was activated. The model was calibrated against the January 1983 potentiometric surface map. The boundary conditions were modified until calibration was obtained with a water balance error below 2% as shown in Figure 2. The actual water balance error was 1.59%. The convergence criteria was 0.001%.

Calculation of Hydraulic Heads with Wells Operating

The next step was to calculate the hydraulic heads with the withdrawal and injection wells operating, as shown in Figure 3. The withdrawal and injection rates for the most recent month, July 1994, were used in this step. Once again, a water balance error of below 2% must be obtained. The actual water balance error was 0.39%. The calculated hydraulic head distribution compares favorably to the actual hydraulic head distribution shown June 1994.

Capture Zones

The final step was to calculate the capture zones for various time periods. Figures 4, 5, and 6 show the capture zones for 10, 25, and 50 years of operation with the wells in their current configuration. As can be seen in Figure 4, the entire plume was captured after 25 years.

C. Summary

The new FLOWPATH model reflects the current conditions at the CSX-Perdido, Alabama site. The new model confirms that design from the previous model will capture the entire benzene plume.

The modeling shows that capture zones appear to be adequate to prevent benzene from traveling beyond its current boundary. In accordance with U.S.EPA guidance, the remediation system effectiveness will be monitored on a specific schedule, and evaluated for any necessary changes annually.

Parameters Used in FLOWPATH Model
Perdido, Alabama

No. of x-grid lines = **91**
No. of y-grid lines = **100**
Unit system: **English (ft/gal/day)**
No. of wells = **20**
No. of constant head nodes = **100+**; a line of to the northeast perpendicular to flow direction, and a line to the southwest perpendicular to flow direction

Soil bulk dry density = **130 lb/ft^3**, from Hough, 1969
Soil organic carbon fraction (f_{oc}) = **0.01**, from Dragun, 1988
Octanol-water partition coefficient K_{ow} = **135**, from Dragun, 1988
Log slope = 1, from Karickhoff et al., 1979
Log Intercept = **-0.21**, from Karickhoff et al., 1979
Partitioning coefficient K_{oc} normalized to f_{oc} = **83.240 l/kg**, calculated
Solid/water partitioning coefficient K_d = **0.832 l/kg**, calculated
Estimated total porosity = **0.3**
Estimated effective porosity = 0.2 from U.S. EPA, 1986 (PB86-224953)
Hydraulic gradient = **0.003**, measured from OW-26 to OW-39 on 1/28/83 and 9/12/91
Retardation coefficient calculated for benzene = **7** (rounded off from worst-case estimate of 6.77)

Hydraulic conductivity = **17 ft/day**
Aquifer bottom elevation = **140 ft**, mean sea level
lADI Convergence criterion - **0.001%**

Table 1

Retardation Coefficient (Worst-Case)

This is a spreadsheet to calculate retardation coefficients and the resulting centroid contaminant velocities in groundwater at Perdido. Worst-case estimates of bulk dry density, Kow, and organic carbon content have been used.

COMPOUND:	Benzene
SOIL BULK DRY DENSITY (lb/ft3):	130
SOIL ORG. CARBON (fraction):	0.01
Kow (unitless):	135
LOG SLOPE:	1
LOG INTERCEPT (Ref: Karickhoff et al., 1979):	-0.21
Koc (l/kg):	83.240
Kd (l/kg):	0.832
ESTIMATED TOTAL POROSITY (unitless):	0.3
GRADIENT (unitless):	0.003
RETARDATION FACTOR (unitless):	6.77

Table 2

Basal Clay Elevations Encountered

Well or Boring No.	Basal Clay Elevation ft, msl	Clay Thickness Penetrated Before Terminating Boring
SB-17	132	2
OW-3	147	2
OW-5	136	2
OW-18	140	12
OW-20	144	12
OW-22	146	11
OW-24	144	9

ENSR
ENSR Consulting and Engineering

MEMORANDUM

TO:	Raaj Patel/Houston	DATE:	August 26, 1994
FROM:	Alan Hopkins	FILE:	2130MO34.01
RE:	Groundwater Modeling-CSX	CC:	

This memo provides an update to the groundwater modeling for the CSX-Perdido, Alabama site. All parameters used in the FLOWPATH model will be discussed in full. Changes from the previous model of the site included using the as-built well locations versus planned locations of withdrawal and injection wells; and changes in the infiltration /recharge rates.

Several figures were generated to illustrate model development and present results.

- new boundary conditions,
- calculated initial potentiometric surface, used to calibrate the model,
- potentiometric surface after withdrawal and injection wells are activated, using their current rates,
- capture zones over a 10-year period,
- capture zones over a 25-year period,
- capture zones over a 50-year period, and
- summary of parameters used as input into the model.

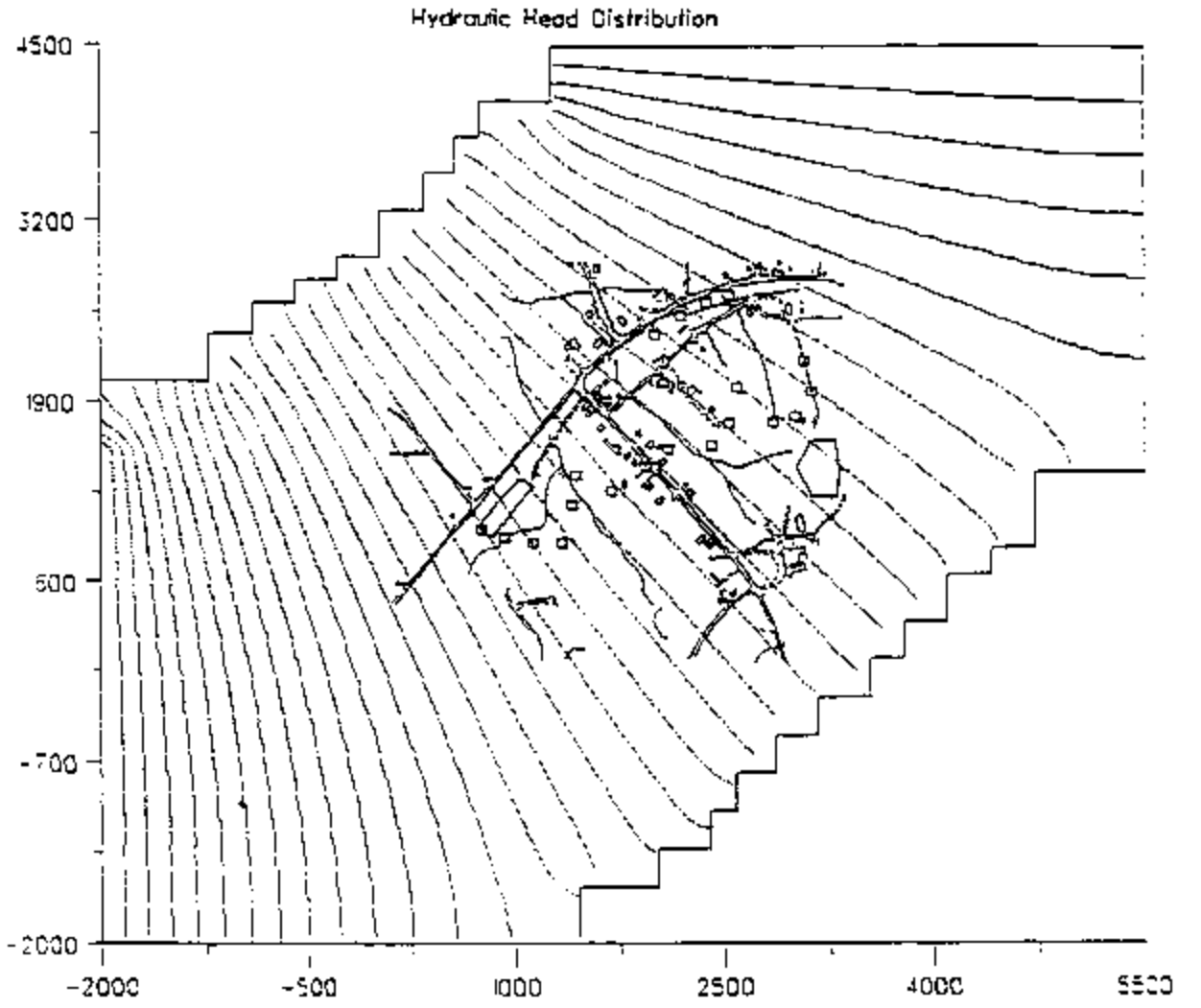


Figure 1. Boundary conditions.

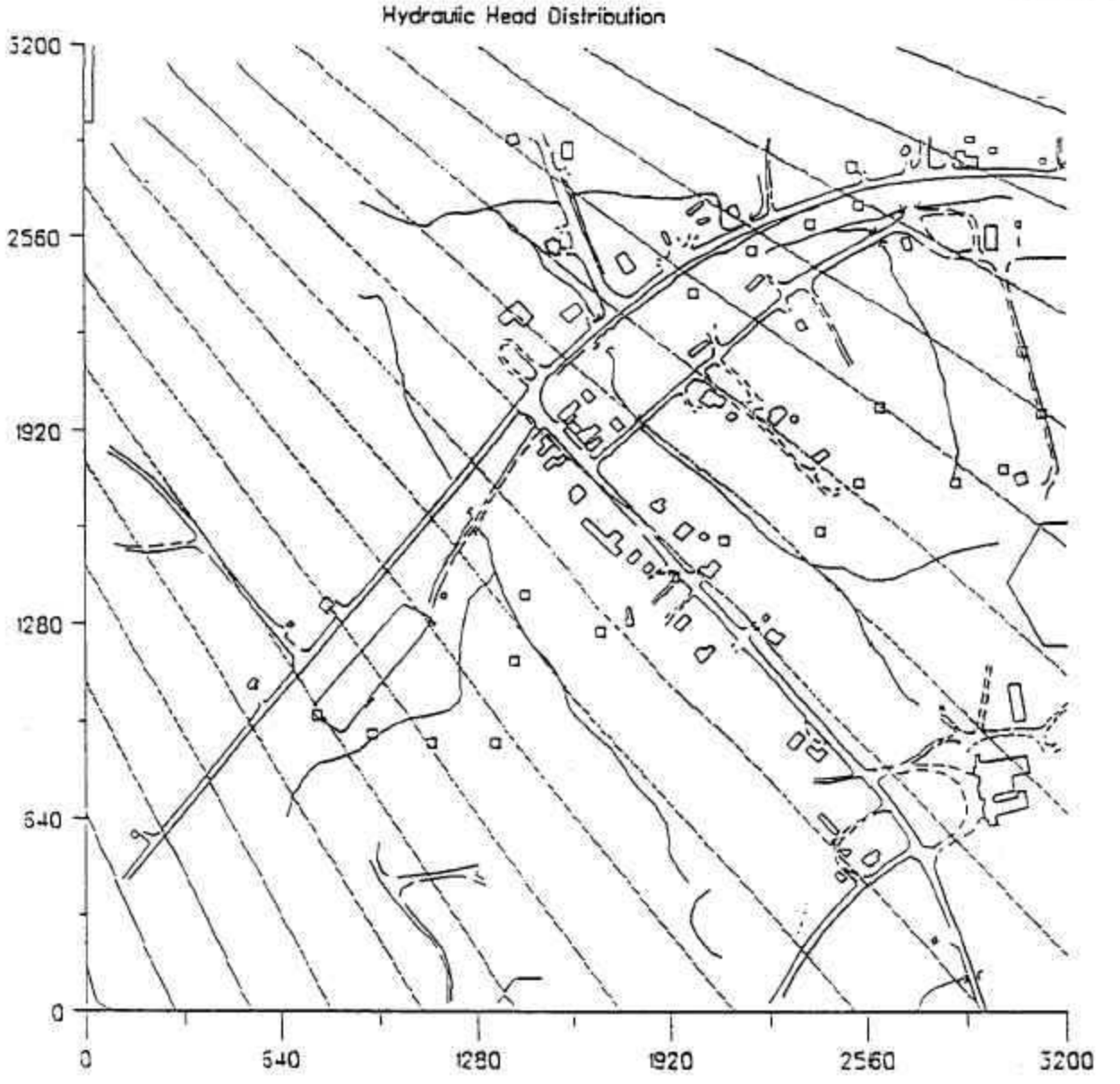


Figure 2. Hydraulic Head Distribution-Calibration to January 1983 Potentiometric Map.

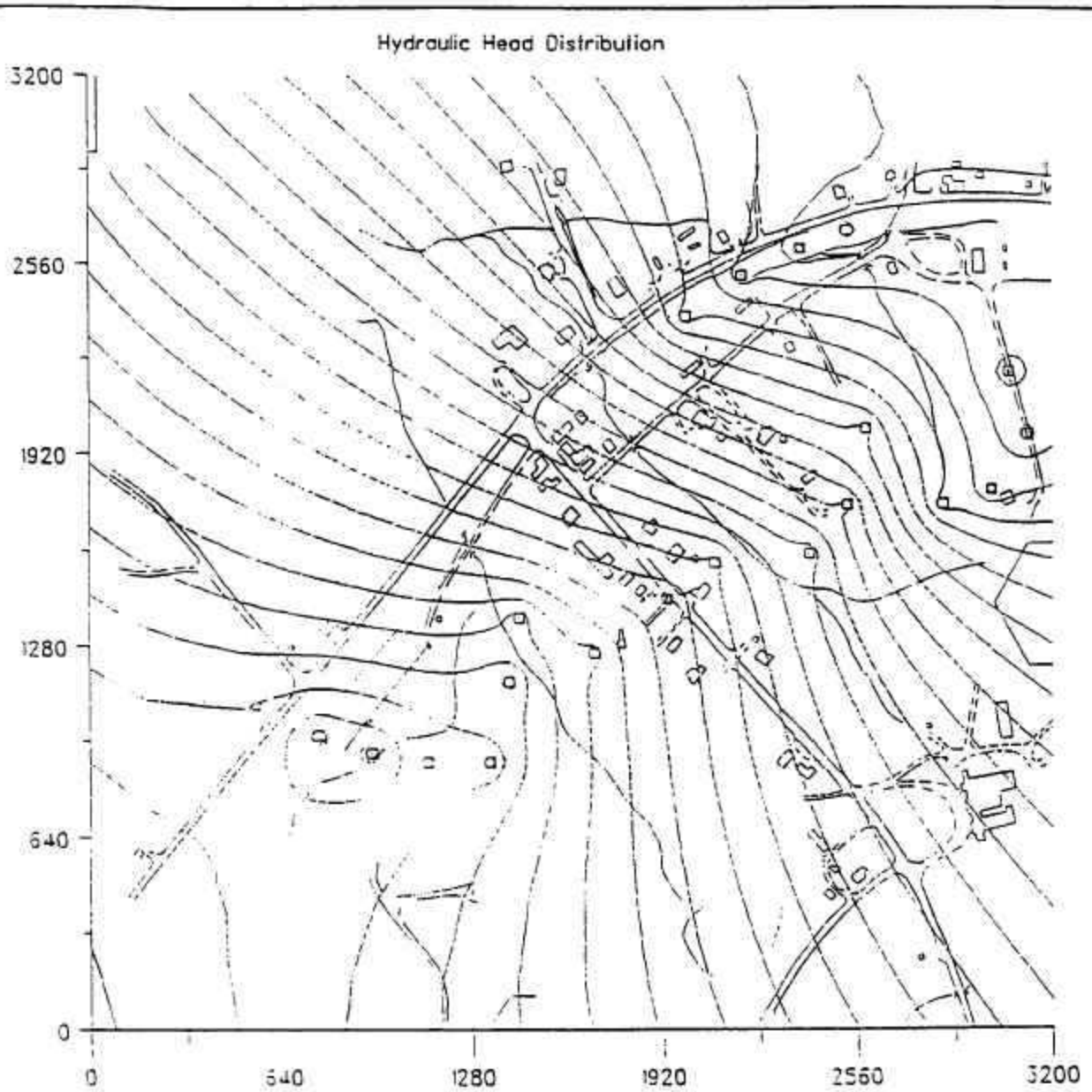


Figure 3. Hydraulic Head Distribution-Withdrawal & Injection Wells in Operation at July, 1994 Rates.

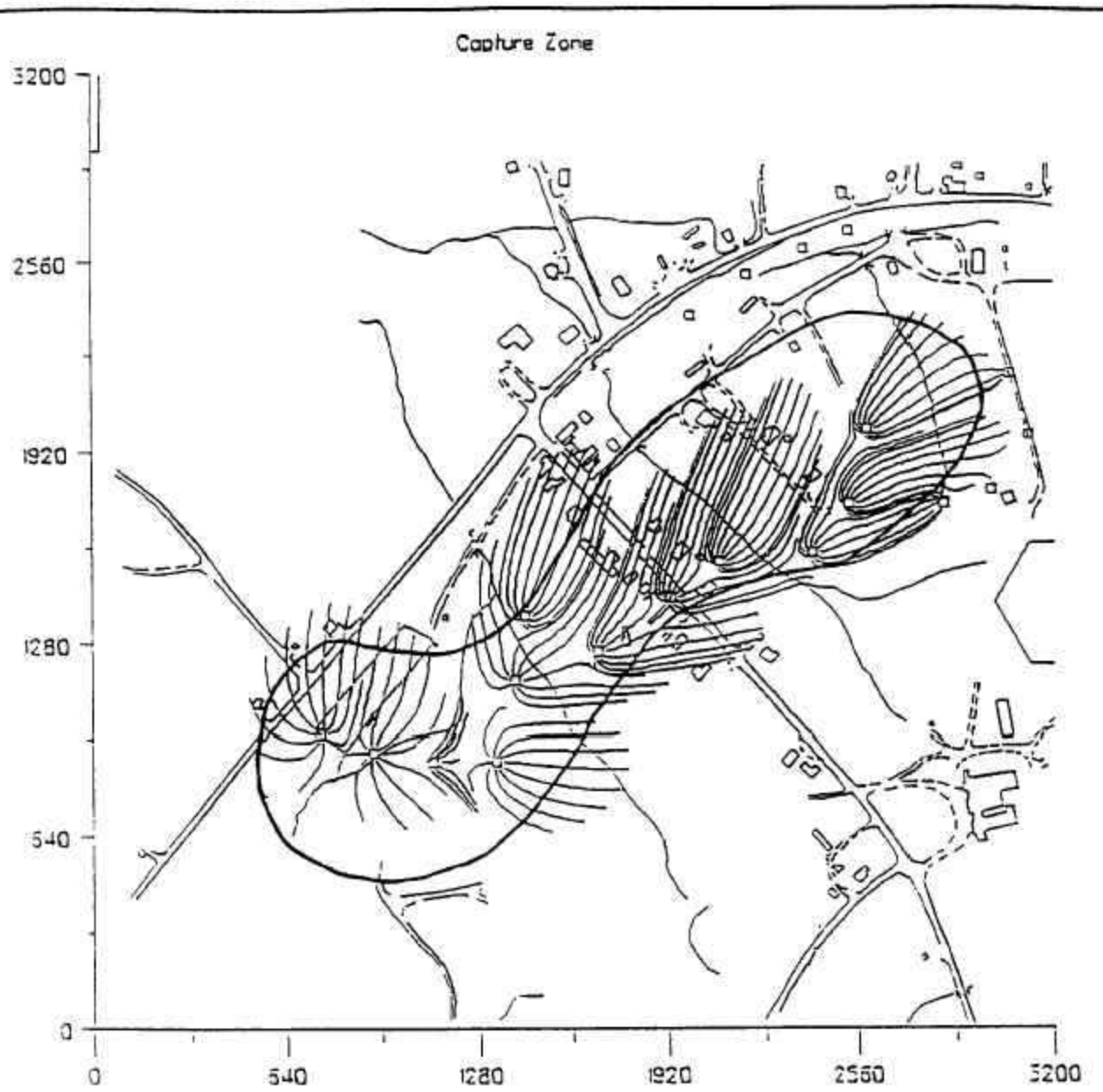


Figure 4. Capture Zones - 10 Years, Benzene Plume from June, 1994 Quarterly Report

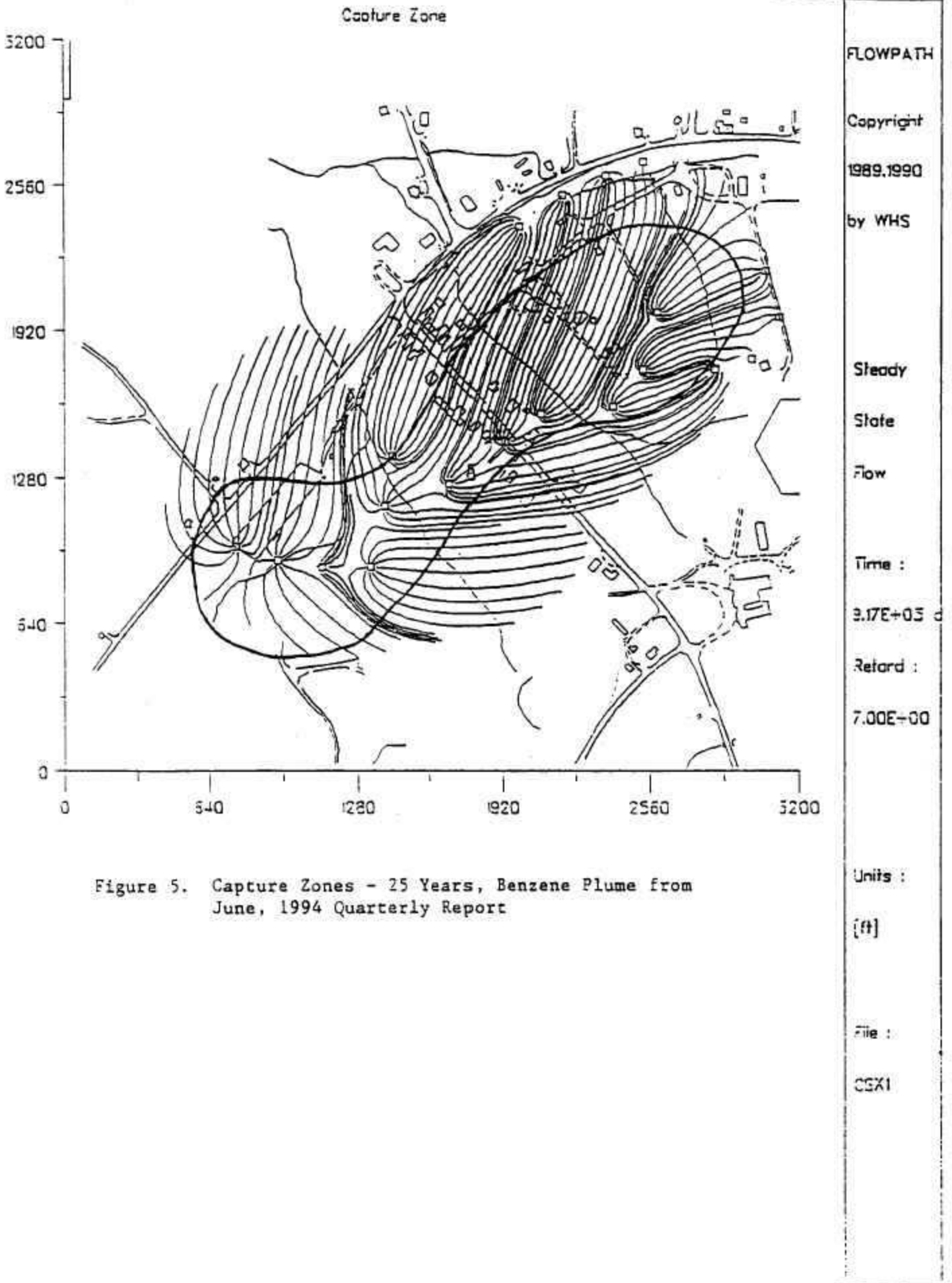


Figure 5. Capture Zones - 25 Years, Benzene Plume from June, 1994 Quarterly Report

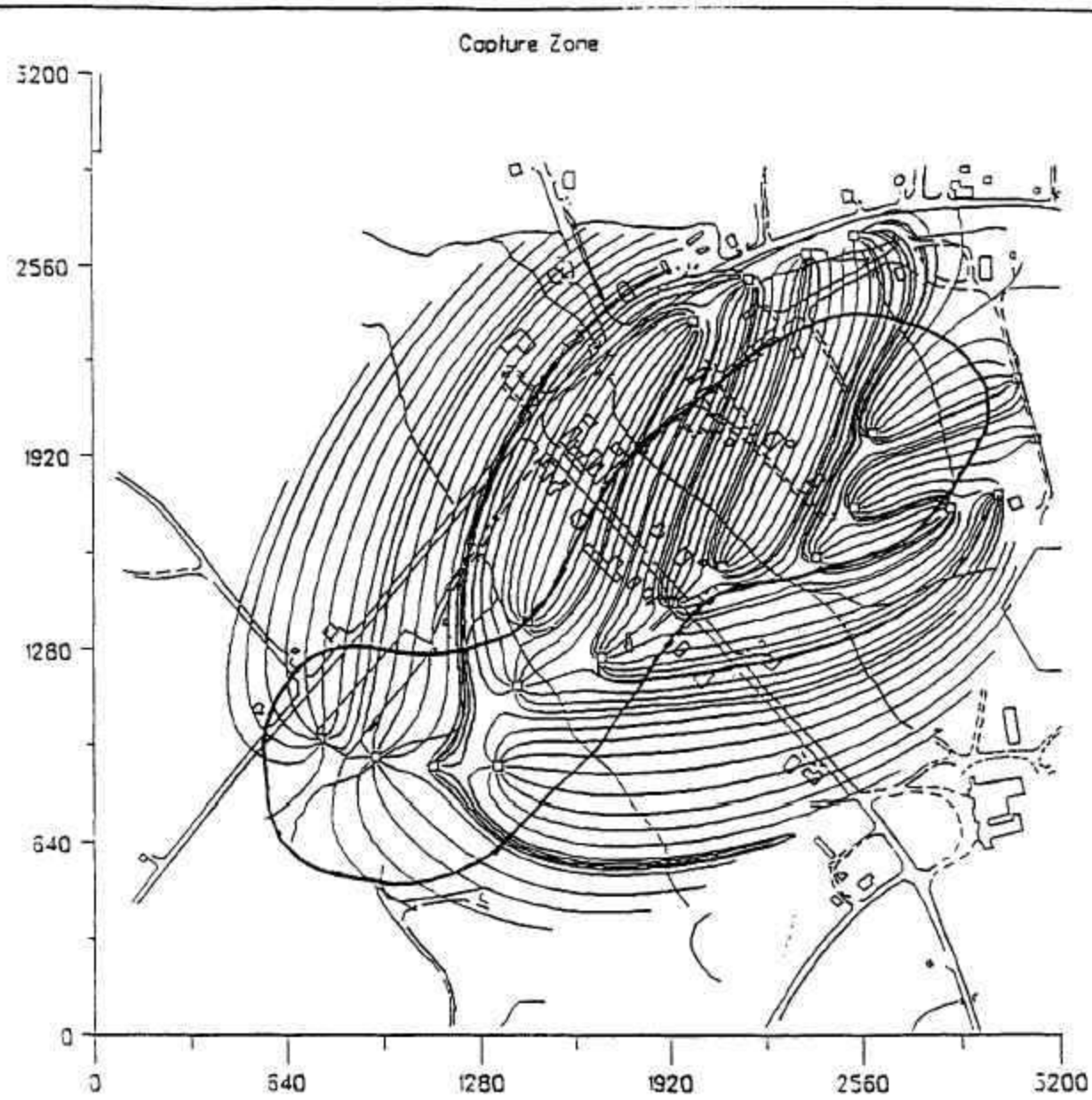


Figure 6. Capture Zones - 50 Years, Benzene Plume from June, 1994 Quarterly Report